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THE COLOR COMPUTER MONTHLY MAGAZINE

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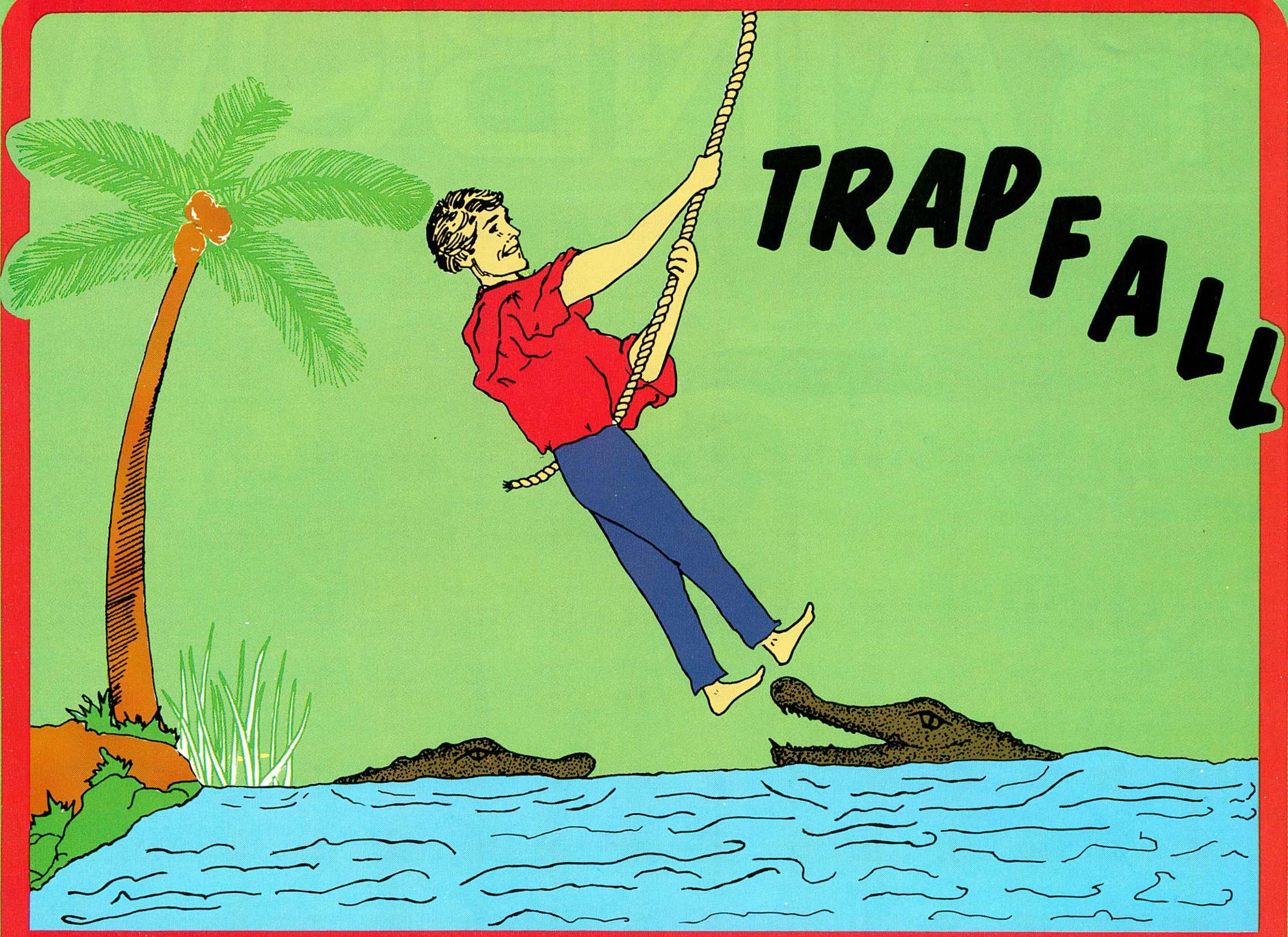

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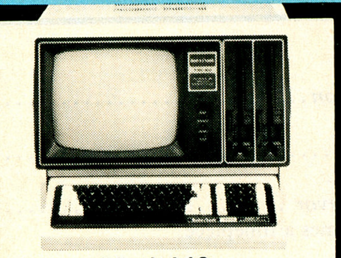

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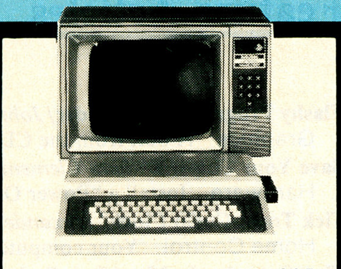

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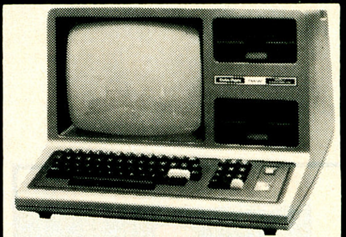

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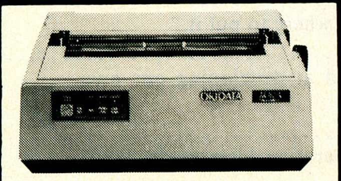

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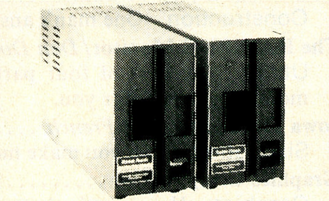

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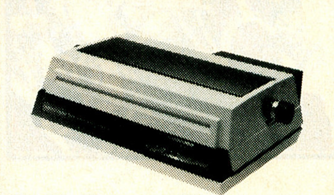

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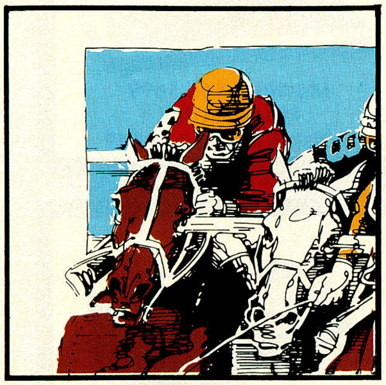
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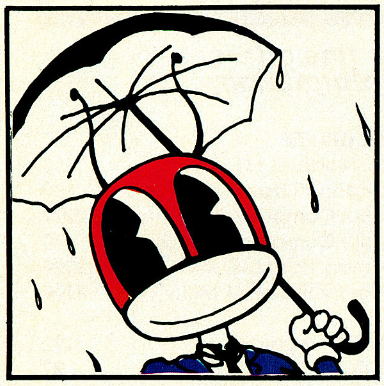
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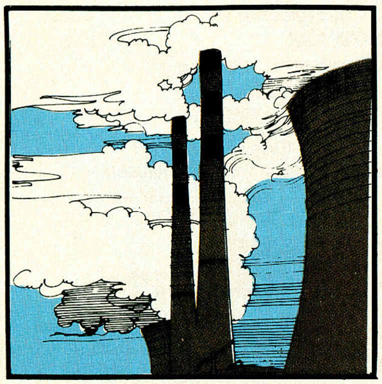
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NEXT MONTH: The printed word will be featured in next month's edition of *the Rainbow.*

We'll have a bunch of word games to amuse you—and to help illustrate some string handling techniques. Plus, some word processing information and—for the first time—the world's most comprehensive chart for converting control codes from one printer to another.

AND . . . More games, more tutorials, the Scoreboard, and more information and reviews on CoCo than you can find anywhere else. It is all coming in next month's *Rainbow!*

AN IMPORTANT ANNOUNCEMENT CONCERNING SUBSCRIPTIONS IS ON PAGE 79

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letters to RAINBOW

THE HAZARDOUS *LEM* STATEMENT

Editor:

AHA! On page 7 of the February 1983 issue, upper-right corner, you said that nothing you enter from the keyboard can hurt your machine. That *ain't* what the repair technician told me when I entered a glass of lemonade into the keyboard! *And*, I completely eliminated all the key-bounce problems that I'd been having. They went down and stayed down. No bouncing there.

Pete Jikeen
Red Bank, TN

INFORMATION PLEASE

Editor:

I have been told a major national magazine published an article on the hazards of using color TVs older than 10 years with microcomputers. I have not read the article, but apparently the danger would be exposure to harmful radiation. If this is the case then I have something else to worry about besides wierdos doctoring up my aspirin because—yes—my CoCo is hooked up to an ancient RCA. Can somebody set my mind at ease, because my mother is worried about me.

Now you know who told me.

Charles H. "Sam" Muncy
Grafton, WV

Editor's Note: Sorry, Sam, we have not heard about this article. Are you sure your Mom doesn't just want you to have more fresh air and sunshine?

Editor:

Thanks to SIR RANDOLPH OF THE MOORS I have decided to expand my 16K computer to 32K and get *Rainbow on Tape*.

Although the program could have been rewritten and shortened considerably I can tell from the listing that it should be an enjoyable game. My congrats to the author and winners of your contest.

So far, I think you have a great magazine and find myself checking the mailbox anxiously for the next issue(s).

Could you possibly tell me how to merge or (concatenate) BASIC programs? The reason I ask is I had agreed with a friend to type in half of Randolph on my 16K and he the other half on his 32K and then we would merge the two halfs into one program on his computer. We tried *PEEKING* and *POKEing* start and end address but it did not work. Finally, after about an hour of useless attempts, I decided to convert my Mr. Edit program and just read the first half in in ASCII and then the second half in ASCII all into one buffer. After saving my buffer on tape I was able to reload the two halves as one program and *RUN* it. There must be an easier way!

George W. Chaffee
Lowell, MA

Editor's Note: There are several programs available to merge Basic listings and we've printed one routine in *the Rainbow*.

Editor:

I have had my Color Computer for a month and a half now and am very pleased with its capabilities. Until I came across your magnificent magazine I was at a total loss of information on where to go for help. Your magazine has really helped me in getting started.

I guess the real reason why I'm writing you is for advice on upgrading my memory. I currently have 16K Extended BASIC, but want to go to 64K (if possible). I've seen advertisements for do-it-yourself kits which go up to 32K and also ads that sell chips for 64K expansion (E-Board). Is it possible for me to upgrade my system to full 64K, or can I only have a certain amount at a time? Also, how can you tell which type of board you have in your color computer? (i.e., D,E, . . .)

I'd appreciate very much if you could give me an answer.

Loren J. Dickey
Tuscon, AZ

Editor's Note: You can tell which board you have by looking at the serial number (through the air holes on the right side—use a flashlight). Your 64K is really two banks of 64K, but you can move the operating system to RAM and get more memory. It, however, is not a full 64K of open RAM—more like about 48K.

Editor:

Can you persuade Roger Schrag to do for Radio Shack's *Color File* what he did for *EDTASM+*? By using Micro Technical Products *ROML*, I have *Color File* on disk, but must still use tape for storage. I'm a duffer at assembly language, so am not yet able to discover the patches necessary to do the change from tape to disk storage for myself. I just bought Radio Shack's *Personafile* on disk, but *Color File* seems much more versatile in some ways, since it allows sorts in seven fields instead of the two in *Personafile*.

One more thing. Jorge Mir's program for using 64K is interesting, but when I tried to use it with his *Unidatfl* I kept getting an OM error in the line that clears string memory, even when I *CLEAR*ed only 22,000. I bought the tape of his *Unidatfl* directly from him last summer, and I haven't yet tried to upgrade it as suggested by Arnold Weiss in his December article.

See you in April at Rainbowfest!

Max Shank
Chicago, IL

Editor:

I've acquired a DWP-410 and interface for my 32K (upgrade) CoCo. I'd love to hear from anyone with a similar setup to compare notes. The vendors I've used—Computer Plus and Jarb—have been excellent.

Finally, keep it comin', *Rainbow*. There's no other single source I learn as much from.

Alan Jay Weiss
Summit, NJ

Editor:

I am glad that *the Rainbow* is doing so well, but sad that so many back issues are out of stock. I am a newcomer to the Color Computer and am glad to see so much available for it. I would appreciate hearing from any readers who might be able to supply me with back issues (Vol. I #11, Vol. II #'s 1-7).

Not wishing to spend all of my time studying BASIC, I quickly purchased an Adventure game: *Raaka-tu*, Wow! As a United Methodist Minister interested in ecumenical affairs, I was not prepared to be the sacrifical object on the high priest's altar—and so many times. I have not made it past this point and would appreciate some pointers (ouch! The statue's arrows are sharp, too!) or suggestions on where to go from here.

Finally, I have obtained an Axiom EX800, 80-column printer and would like some help in hooking it up to the Color Computer. I can get it to work, but the resulting printed page is not what I type into the computer. Help!

Thank you for a very fine publication. I have received much better service from you than any other publication for the Color Computer and I appreciate it very much.

Rev. Richard A. Lochner
Topeka, IN

Editor:

I love your magazine and don't see how I could get along without it.

There is one thing I need to know. I have a 16K CoCo and want/need 32K. Trouble is I have Color and Extended Color BASIC, version 1.0, and A "D" board.

Is there any way I can piggyback 16K chips? Do I only have to replace Color BASIC with version 1.1? Or is more involved? I don't have the $ for 32/64 MOD either from Radio Shack or myself.

Dave Smallman
Strongsville, OH

ﾈﾉﾊﾋﾌﾍﾎﾏﾐﾑ

Editor:

The characters given below were printed on the CGP-115 Color Graphic Printer by means of *Telewriter* (version 1.0)'s direct entry mode, the entries being @0 through @9 and then A0 through F3, with appropriately interspersed 13's for a line feed. I can see no way of writing them directly from BASIC, nor any particular value in them to Occidental users: But do you suppose anyone in Fort Worth knew they were there?

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R.W. Odlin
Sedro-Woolley, WA

BOUQUET AND BRICKBATS

Editor:

In the January edition I noticed a letter by Harvey A. Dapeer which praised a software product by Snake Mountain Software called *The Solution.* I was extremely pleased to see this letter as I had just ordered a copy of *The Solution* myself. I now wish to wholeheartedly endorse his favorable opinion of this product. The documentation is first class and, in my opinion, this is the best software to make use of the CoCo more enjoyable. The PMODE 4 (1) screen is a delight to work with. I would be most interested if you could review their ROM Pack version of *The Solution*

John Lester
Tampa, FA

Editor:

I want to thank you for the integrity and honesty you have shown in publishing a negative report on one of your major advertisers. It proves that you are looking out for your subscribers.

About two weeks ago, Bob Rosen called in reference to my complaint about the Spectrum Joystick. He was very apologetic explaining that he had never received my original letter and the first he had heard of it was in your letters column. His sincerity made me feel that the great letter jam, better known as the Post Office, had struck again. He asked if I wanted a refund or replacement. I opted for a replacement and I'm glad I did. It is a great improvement over the original and I am very satisfied.

I would like to thank Mr. Rosen for his call and a very fine product. It is nice to know that he stands behind his products.

I hope you print this letter to set the record straight. Keep publishing *THE* Color Computer Magazine.

John M. Heinz
Katy, TX

Editor:

I would like to extend our thanks to Gerry Schechter and *the Rainbow* for the kind review of our *ROML* program (February 1983, page 197). I would, however, like to let your readers know that *ROML* does indeed load ROM Pak software successfully, from either tape or disk. Apparently, Mr. Schechter did not have a 64K system upon which to try this feature of *ROML.* Also, we would like everyone to know that every purchaser of *ROML* receives two user's manuals, one for *ROML* and one for *TAP2DSK* (which is a utility program that comes with *ROML*).

Roger L. Degler
Micro Technical Products, Inc.

TELEWRITER COLORS

Editor:

This letter is in response to the letter from Herbert B. Ridge in the February issue. Mr. Ridge wanted to know how to get rid of the "red, blue, and green" characters when using *Telewriter.* I have a fix that works with the cassette version. After *CLOADM*ing the program, do a *POKE* &H2FDF, &HF0 then *EXEC* normally. This causes *Telewriter* to use color set 0 for the screen, which is black/green instead of black/buff.

If you want to save a copy of *Telewriter* with the "green screen" modification, do the following:

```
CLOADM"TELEWRIT"
POKE &H2FDF, &HF0
CSAVEM"TELEWRIT", &H1E28,
  &H3767, &H1E2E
```

I found this out with the *ZBUG* monitor in the *EDTASM+* cartridge. Actually, I blundered into it while messing around trying to figure out how they did the 50-by-24 screen format.

Gregory Douglas
Boulder, CO

Editor's Note: Drew Shorter, whose letter follows, offered the very same solution as well as some additional comments.

Editor:

For those with Okidata 82A and similar printers, location &H341E may be changed to an &H0A to enable double and triple spacing with a line feed in place of a carriage return.

The new version of *Telewriter—Telewriter-64*—allows you to choose either green or buff background and has many other enhancements.

The red and blue colors come from a phenomenon known as "aliasing." Many excellent high-resolution games take advantage of this effect to create multicolor displays. Some computers such as the Apple use aliasing exclusively (so I read) to get multiple colors. For some reason, aliasing occurs when you have a buff background and not with green.

I'm afraid I can't help with the page header problem.

Anyway, keep up the good work. You have created a great magazine that we read from cover to cover as soon as we get it every month.

Drew Shorter
Cuyahoga Falls, OH

CLARIFICATION

Editor:

A recent letter to *Rainbow* from Duff Kennedy, though praising our word processor, *Telewriter,* complained of unanswered support letters from Cognitec and went so far as to imply that we do not support our product.

This hurts me very deeply, as I have spent literally thousands of hours on the phone answering questions about *Telewriter.* As I explained to Mr. Kennedy in a letter in July 1982, it is often impossible to answer questions asked in letters when insufficient information is given. It is very time-consuming and very frustrating, and the most frustrating part is that, frequently, the question asked has already been answered in the manual.

So, yes, some letters have gone unanswered, for this reason, and for the other Murphy-reasons that afflict any business. But the majority of support letters have been answered (despite the inherent frustration). Calls, of course, are answered, and we do our best to help. I used to answer the phones myself 50 hours per week, but it's clear I can no longer continue to do this if I am ever to write another piece of software.

The people who *do* answer now, have used *Telewriter* extensively and can help you with a lot of questions—*if* you give them concrete, precise information about what's wrong. If they can't help, they will tell you when you can reach me.

Howard Cohen, President
Cognitec

Editor:

This is in reply to Mr. Hilton Wasserman's letter in February's *Rainbow.* The first part of "How Much Will it Cost to Buy on Time?" computes payments based on a specified length of time at some rate of interest. The second part of the program is to show what advantage may be gained by making payments somewhat more than the amount calculated in the first part, plus some random amounts at random times. Therefore, the last payment will be the balance remaining. It would be pure luck if the new monthly amount and the extra payments happened to work out such that there is a zero balance!

Francis Sherwood
Ft. Pierce, FL

TRAFFIC CONTROLLER

Editor:

I recently bought the new program cartridge *Poltergeist.* It is the best game in my collection along with being the one played the most. The only problem with this exciting game is that you get sent back to screen one after everytime you lose a man.

To combat this problem, my brother,-Mike, (the most avid game player) discovered that pushing the fire button while on the first screen prevents the cars from appearing. Once this is done, one can get past screen one fairly easy.

Keep up the fine work on your excellent magazine.

Kari Hogan
Cedar Falls, IA

IT AIN'T VEGAS

Editor:

I have a complaint I must voice about programmers who offer Las Vegas type games such as Craps or Blackjack for sale in the pages of your magazine. Before they put such a program on tape they ought to at least learn the rules of the games as played in the casinos.

For instance I don't know of any casino which pays you for five cards and under 21, nor does the dealer win if he holds such cards. If the dealer has an ace as an up card when the player takes insurance, the game should either inform the player that the dealer does not hold blackjack and play continues, or the hand should be exposed if the dealer does and play on that particular hand is halted with no cards being dealt to player.

I have gotten these so-called casino games from two of the advertisers in *the Rainbow* and I acquired them on the basis that they were advertised as true Las Vegas type games. Well they *ain't*. No serious player of Blackjack or Craps would play the games the way they are programmed.

Thank you for putting out an excellent magazine for users of the Color Computer. I read each issue from cover to cover including the ads.

Harry Norkin
Thousand Oaks, CA

HINTS 'n' TIPS

Editor:

I have come across a method for achieving a *PCLEAR 0* effect for Disk Extended Color Basic. It is as follows:

1. On power up, *POKE* 25,14 and then *POKE* 26,0
2. Type *NEW* and *PRINT MEM*. There should be 12584 bytes free.

I have not had a failure with this method as of yet, and have *SAVEd, LOADed*, and created disk files with this method. All the rules for *PCLEAR 0* for non-disk systems apply here as well.

Congratulations on your new format. I was a bit blinded by the glossy pages, but if that is the price for beauty, pay it.

John. C. Roth
Salem, OR

Editor:

In response to the letter by John Schmidt (February 1983) concerning how to get the audio from *SOUND* and *PLAY* commands to tape, the solution is quite simple. All sounds made by CoCo are automatically transfered to cassette if the record button is pressed. Thus, all that remains is to type *MOTOR ON* or pull out the small gray plug on the tape recorder to move the tape.

Several people have asked how to put a screen print program made for a 16K machine into the upper memory of a 32K machine (so the memory of a 32K machine won't be cut in half). Well, I don't know how, but a *POKE* 25,64:*NEW* will put the BASIC program past the screen print program thus giving 16K of memory instead of 6K (taking into consideration *PCLEAR 4* has been typed in). However, several steps must be taken. First, all the *PCLEAR* values in the program must be deleted. Second, the commands *RUN* and *NEW* will give a SYNTAX ERROR (except one when *POKE* 25,64:*NEW* is typed in). To operate the BASIC program, type *GOTO* "second line number" (typing *GOTO* "first line number" will also result in a SYNTAX ERROR, so put in a *REM* line before the first official line number in the program). Third, be sure to type in *CLEAR* 200,32767 or something might go wrong. By the way, all the graphic pages are reserved so all the *PMODES* can be used.

I enjoy your magazine very much.

Paul Gani
Marshfield, WI

OUR ENGLISH CHANNEL

Editor:

My interest started one day when I was reading (in bed) a British computer magazine with a review of the Dragon-32, a new computer made in Wales. On reading the specifications, my eye caught the word "6809 processor"—the same as the Tandy TRS-80 Color Computer.

I suddenly realized the implication and jumped out of bed shouting "Eureka." My wife thought I had gone *mad*.

We get a copy of *the Rainbow* airmailed to us. We hope that *Rainbow* will continue to grow over here. I am sure that when the Dragon reaches the you in the States that *the Rainbow* will feature Dragon articles. Happy computing to you all.

Harold Berkeley
Prestwich, Manchester, England

CLUBS, CLUBS, CLUBS

Editor:

In order to get in contact with more CoCo owners here in Mexico City, I will found the Mexico City Color Computer Club. I have developed several programs which I would like to have others benefit from.

Every time I start up my computer, I have to turn it off and on until it works properly. In the years I've been using CoCo, I have learned that it only works well when all the letters look exactly the same color. I think this is a problem with the electric energy, since here in Mexico, it varies very much. If I don't turn it off and on I don't get the right color, it always hangs up, displaying the famous alpha sign (PRINT@). My address and phone: Laja # 232, 01900 Mexico D.F., Tel. 5-68-78-75.

Marcelo Luft
Mexico City, Mexico

Editor:

A CoCo Special Interest Group meets the third Saturday of every month at JARB Software, 1636 D Avenue, Suite C, National City, CA 92050. Interested CoCo users are welcome to attend or to contact CoCo SIG at (619) 474-6213.

Joe Bennett
San Diego, CA

Editor:

I would like to thank all companies (especially *the Rainbow*) that have not forgotten us Europeans and *do* ship overseas. For example, when I ordered some materials from Mark Data Products and Tox Mix Software, it took only 21 days from the day I mailed my order to the day I received the products. That's what I call service! Please, all dealers, mark your overseas shipping charge on your ads. I'd feel a lot more comfortable about sending my money in if you did.

By the way, *Donkey King* is an excellent program: you can't go wrong with that one. How come nobody has translated the original *Colossal Cave* adventure on the Color Computer? It fits in 32K, doesn't it?

Could you tell me what is the "magic number" on Nanos Systems reference card? How to disable the auto start on *Astro Blast* and *Cave Hunter?*

How come *Rainbow on Tape* doesn't ship overseas? They could at least ship back issues. There is no sense in typing an adventure in. First, you learn most of the tricks and solutions; secondly, you are bound to get at least one '? SN ERROR' during the game.

If there are any Finnish *Rainbow* readers out there, please call me at (90) 748-521 and we'll get together and form a club.

Lastly, I would like to thank *the Rainbow* for being what it is: The best source of Color Computer information and a great computer magazine. (I bet you are getting tired of hearing that!)

Timo Talasmaa
Met Sopuruntie 9A 12
SF 00630 Helsinki 63
Finland

Editor's Note: Some things we *never* get tired of hearing. Thank you! And, yes, *Rainbow on Tape* is available worldwide.

Editor:

I am interested in helping form a 80C User Group in the Chattanooga area. If anyone is interested they may contact me at 3617 Cline Road, East Ridge, TN 37412 or phone (615) 867-5682.

Keep up the excellent work.

Jim Perkins
East Ridge, TN

Editor:

There is finally a users group just for CoCo owners in the Milwaukee area. It is called CoCo-MUG (Color Computer-Milwaukee Users Group) and it is looking for new members. Anyone interested should contact CoCo-MUG, c/o Tom Fandre, 2420 Misty Lane, Waukesha, WI 53186, (414) 542-0600.

Steve Koszuta, Secretary
Milwaukee, WI

Editor:

We would like to announce the formal formation of the Miami Valley Color Computer Club serving Miami and Shelby counties in Ohio. The MVCCC meets the second Sunday of each month at the Hayner Cultural Center, 301 W. Main Street, Troy, Ohio. The club currently has more than 25 active members and is growing daily.

R. Douglas Wales, President
Troy, OH

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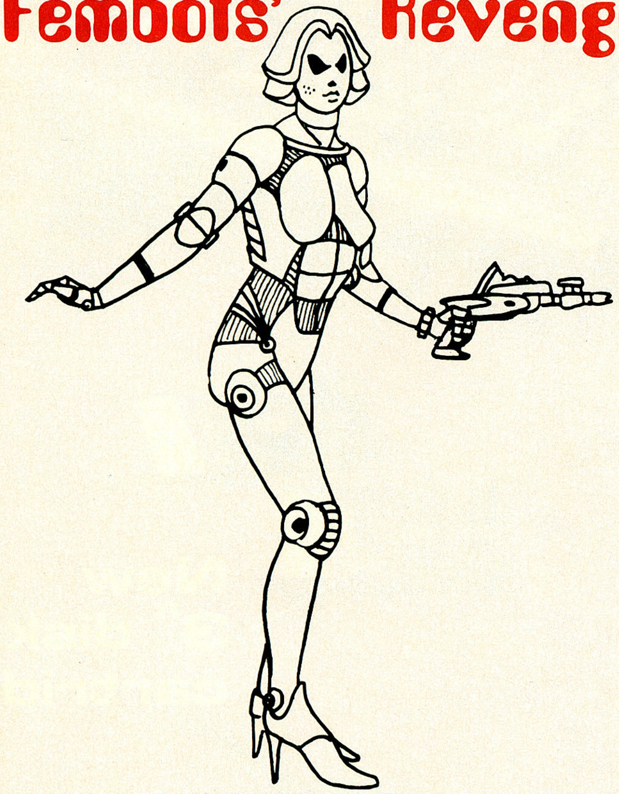

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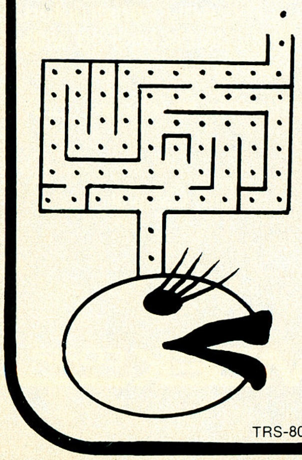

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by Tom Czarnecki

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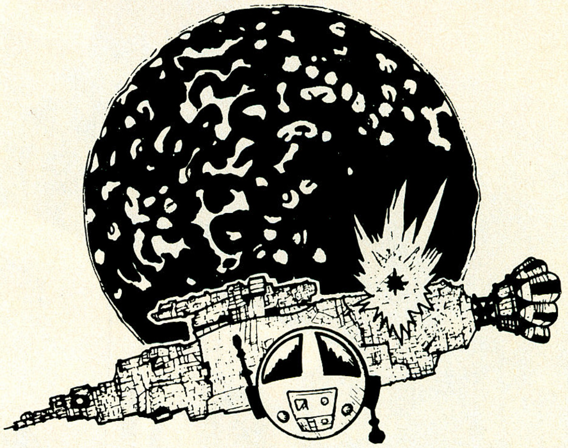

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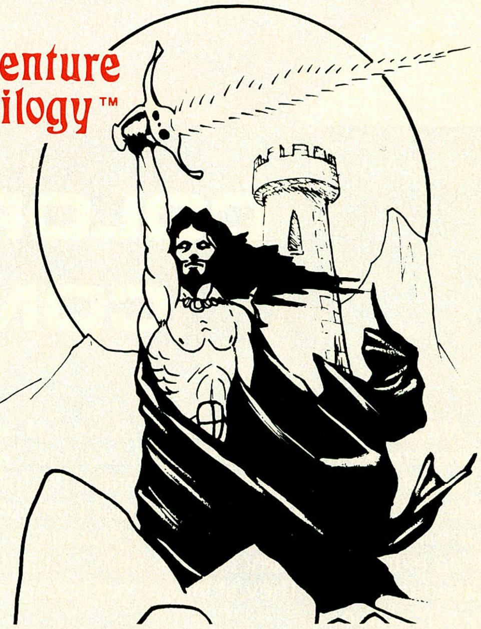

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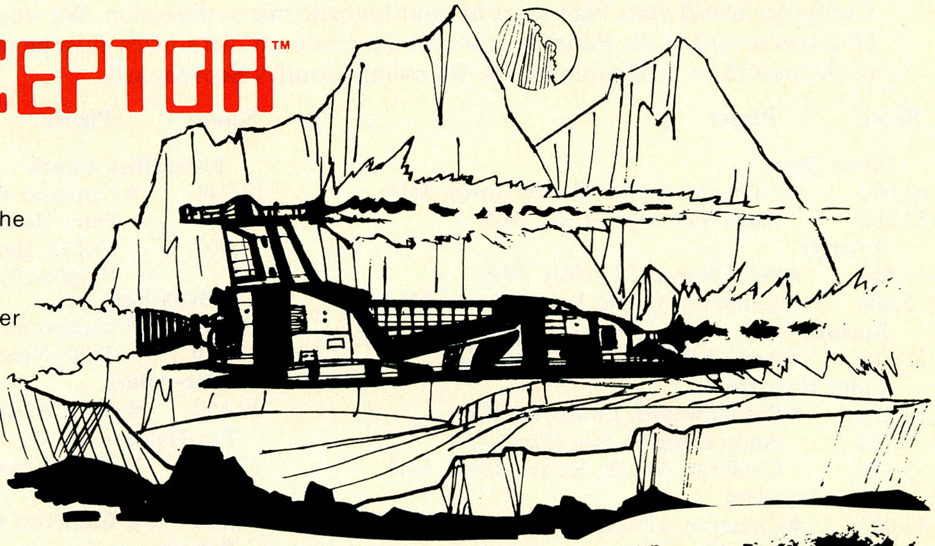

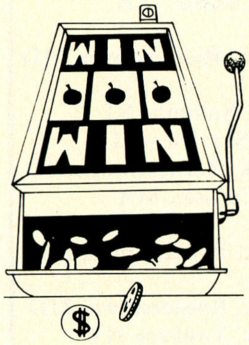

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by Dan Nelson

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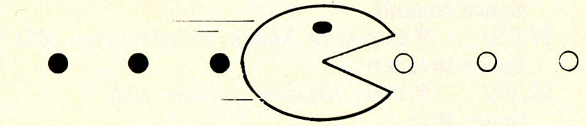

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RAINBOW SCOREBOARD

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in *the Rainbow's* Scoreboard column. All entries must be received by the first of the month to be eligible for the following month's Scoreboard.

Score	Player
Astro Blast	
63,000	★Cameron Amick, Reisterstown, MD
53,000	Peter Niessen, Carlisle, MA
Avenger	
11,560	★Peter Niessen, Carlisle, MA
5,000	Cameron Amick, Reisterstown, MD
Bustout	
25,510	★Andy Klingler, San Diego, CA
Color Haywire	
10,250	★Pat Downard, Louisville, KY
9,750	Andy Klingler, San Diego, CA
9,150	Cameron Amick, Reisterstown, MD
Color Invaders	
83,000	★Cameron Amick, Reisterstown, MD
Color Meteoroids	
149,000	★Cameron Amick, Reisterstown, MD
Color Scarfman	
446,000	★Andy Klingler, San Diego, CA
388,060	Michelle Thompson, Milpitas, MS
315,120	Kim Hansen, Ponoka, Alberta, Canada (Level 15)
Colorpede	
245,723	★Cameron Amick, Reisterstown, MD
Colour Pac Attack	
193,000	★Cameron Amick, Reisterstown, MD
Conquest Of Kzirgla	
10,399	★Scott Sehlhorst, Columbia, SC
Donkey King	
319,000	★Steve Skrzyniarz, Tacoma, WA
217,000	Eric Hemmert, Hasbrouck Heights, NJ
156,400	Andy Klingler, Sand Deigo, CA
115,600	Cameron Amick, Reisterstown, MD
98,000	Cameron Amick, Reisterstown, MD
Doubleback	
25,960	★Mary H. Thomas, Louisville, KY
Dunkey Munkey	
1,099,400	★Andrew Herron, High Point, NC
1,000,500	Wendy Johnson, San Jose, CA
626,400	Peter Niessen, Carlisle, MA
362,000	Chris Friend, Lake Elmo, MN
311,500	Sara Hennessey, Golden Valley, MN
Galactic Attack	
31,780	★Andy Klingler, San Diego, CA
Ghost Gobbler	
825,250	★Randy Gerber, Wilmette, IL
Katerpillar Attack	
10,249	★Cameron Amick, Reisterstown, MD
7,556	Peter Niessen, Carlisle, MA
7,007	Eric D. Hemmert, Hasbrouck Heights, NJ
Mega-Bug	
6,211	★Cameron Amick, Reisterstown, MD
3,920	Peter Niessen, Carlisle, MA
Pac-Attack	
30,650	★Peter Niessen, Carlisle, MA
Pac-Droids	
17,000	★Peter Niessen, Carlisle, MA
Pacet Man	
5,000	★Cameron Amick, Reisterstown, MD
Polaris	
69,455	★Alan Jay Weiss, Summit, NJ
45,000	Andy Klingler, San Diego, CA
36,000	Cameron Amick, Reisterstown, MD
30,500	Peter Niessen, Carlisle, MA
Pop Corn	
110,570	★Cameron Amick, Reisterstown, MD
Protectors	
358,514	★Cameron Amick, Reisterstown, MD
94,000	Gerry Schechter, Yonkers, NY
Skiing	
1:04.17	★Andy Klingler, San Digo, CA (No Errors)
1:13.25	★Cameron Amick, Reisterstown, MD
Sky-Defense	
5,200	★Cameron Amick, Reisterstown, MD
Space Assault	
28,850	★Cameron Amick, Reisterstown, MD
Space Invaders	
62,300	★Peter Niessen, Carlisle, MA
Space War	
116,000	★Peter Niessen, Carlisle, MA
Starfire	
1,320,150	★Joy Bailey, Lexington, NC
464,700	Cameron Amick, Reisterstown, MD
Starship Chameleon	
68,500	★Cameron Amick, Reisterstown, MD
Storm	
380,000	★Cameron Amick, Reisterstown, MD
60,265	Peter Niessen, Carlisle, MA
Venturer	
1,526,200	★Peter Niessen, Carlisle, MA
313,250	David Glovinsky, Staten Island, NY

Print #-2,

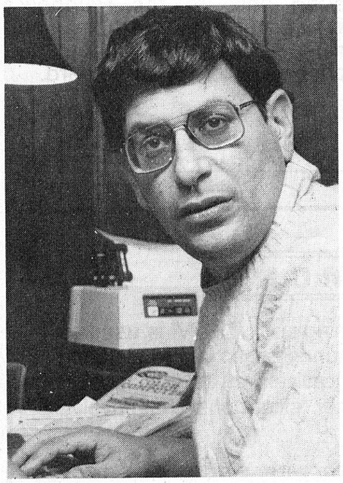
We are really getting ready for RAINBOWfest as I write this month's column. What has been particularly gratifying is that a large number of you have written to say that you will be in attendance. I think I can say, without much qualification, that RAINBOWfest—particularly as a first-time enterprise—will be a success!

One of the things we said about the show a month ago comes up to be even more important now. That is the addition of a series of seminars and workshops for "CoCo's very first show." We wanted RAINBOWfest to be something more than just a trade show—and, thanks to the generous support of a number of people—it will be.

Don Inman has graciously consented to be the guest speaker at the breakfast Saturday morning. All of you are well acquainted with the remarkable expertise Don has brought in his columns in *the Rainbow* and the many books he has authored. I, for one, look forward to hearing him.

Aside from Don's talk, the breakfast will offer an opportunity for you to see more CoCo owners in one place than you ever have in your life! It has been set for the opening of the first full day of the show primarily as a get-together. I really hope you won't miss it!

I've talked in the past about "CoCo Community." The breakfast is one way we can all express that CoCo Community and break bread with one another. I'm really excited about it and hope to see many of you there.



And, speaking of CoCo Community, I'd like to thank the members of the Northern Illinois Color Computer Club for volunteering to conduct the series of seminars we have planned on BASIC. This is taking a great deal of planning and coordinating. Thank you, NICCC!

One of our seminar leaders will be a new name to many of you, Tom Nelson. Tom is an attorney with the state of Minnesota, a principal in Nelson Software and our newest columnist. We welcome Tom and believe his commentaries on computers, software and the law under the heading *CoCo Counsel* will provide a significant contribution to the Color Computer world.

Others who will be talking include Chris Latham, who authored the nuclear power plant simulation which appears in this month's issue. He'll talk about machine language animation. Fred Scerbo of IMB, E. R. Bailey of Micro Logic and a number of others will also be on hand. We think these will be interesting sessions.

Of some major importance to Color Computer Clubs and User Groups is a meeting with me during RAINBOWfest. As you know, one of our major goals has been to support these groups, and we hope this meeting will provide us with some additional ways to be of help. If you are a member or an officer of a Color Computer Club or User Group, I hope you will make it your business to see someone is in attendance.

This officially announces the beginning of *the Rainbow's* first Simulation Contest. We've tried to provide a number of simulations in this month's issue to give you some idea of what this kind of program can be like. And, I am pleased to say we will have some excellent prizes—with the top prize a brand new Epson FX-80, 4K serial printer buffer and cable donated by JARB Software. Total value of this one prize alone is more than $800. So, let's get those CoCo's working. We will announce more prizes later, but expect them to be well worth your valuable programming time.

The deadline for the contest is July 30. That is a change from what we announced in a preliminary way last month. All entries must be postmarked by July 30 to be eligible.

All entries become the property of Falsoft, Inc., and *the Rainbow*. Decision of the judges is final. Your simulation must be an original work—no "conversions"

(continued on Page 172)

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BUILDING A RAINBOW

The Simulation Issue . . .
The Bound-For-Chicago Edition . . .
The monthly storm before **the Rainbow** *appears . . .*
The Production Express, heading for Printer's Station . . .

Do all Civil War movies start out with the sound of a train whistle echoing through the station? And, as surely as the sweethearts are left behind, won't that steam engine soon be puffing black smoke and thundering 'round the bend just as we catch sight of the mile-high trestle? And, at the very last second before the tracks trade ground for the timber, doesn't somebody always go tumbling off the train and rolling down the bank?

I feel like I was pushed.

True enough, the momentum is enough to carry the Production Express across the wide chasm and on to Printer's Station, but what a time to jump off and count the cars! My heart is with those still on board as I watch the caboose disappear in the distance.

The analogy is a bit worn, perhaps, but putting together a magazine is a lot like forming a train. The cargo is produced sometimes months in advance. The bill of lading—we call it booking—takes weeks. A legal-sized clipboard serves as our switching yard, and, as on a mail train, a relentless pace is kept with only a breathless stop before still another train pulls out.

A lot of precious cargo missed the train this time. That's because, even with 244 pages, there's only so much room.

We do have a mighty trainload for you, though, this month. Dozens of articles. Dozens of programs. Who else offers so much in one issue just for the Color Computer?

From the creative genius of many "big name" contributing editors to the enjoyable home style writing of our *Rainbow* reviewers, we truly believe there's something for everyone, and some things for everybody. We hope you agree.

This is our simulation issue. Along with announcing our simulation contest—we already have two entries—we have two solid examples of simulations to show you how it's done. More simulations will appear in next month's *Rainbow*, too.

May I recommend a book? *Stimulating Simulations* by C.W. Engle is an excellent introduction to the art of creating and developing simulations. It's published by Hayden Book Co. as part of their microcomputer series.

By the way, if you think this month's nuclear power simulation isn't your thing, let me point out that one of its co-creators is also the author of *The King* for Tom Mix Software. I know Dr. Doom loves meltdown-a-minute action.

Ms. Doom, on the other hand, is already addicted to *Color Poker*, a creation of Joseph Kohn's that is a delight to play.

New this month is our *CoCo Counsel* department, featuring Tom Nelson of Nelson Software. If you are marketing software, or planning to, check out his first column this month. Tom will be with us in Chicago, too, to hold a special seminar at *RAINBOWfest*.

Also new this month is our *Received & Certified*, which spotlights new product arrivals at *the Rainbow*.

New, too, is our tear-out card to order magazine subscriptions, renewals and *Rainbow On Tape*. That brings me to a final word: An invitation.

If you aren't among those who have a year 'round pass to *the Rainbow's* trainload of top-flight articles and programs, I hope you'll pull out that subscription card and climb aboard.

—Jim Reed

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Here's A Flashy Little Program, By Thunder

By John Plaxton

The following program, *Lightning,* continually generates a single flash of forked lightning across a PMODE4 screen. Each flash is different.

The program is part of a father-son effort in generating an electronic window display of numerous scenes suitable for Halloween.

You may be interested in trying to devise a suitable program for thunder.

The listing:

400	0259
650	044A
END	06CE

```
10 '        L
20 '         I
30 '         G
40 '          H
50 '           T
60 '          N  N
70 '        I    I
80 '         N    N
90 '        G       G
100 '
110 'define variables, display
120 DIM X(14),X1(14),Y(14),Y1(14
)
130 PMODE4,1
140 PCLS
150 SCREEN1,1
200 'generate initial position
210 X(0)=150+RND(75)*(((RND(2)>1
)*2)+1)
220 Y(0)=0
230 X1(0)=X(0):Y1(0)=0
240 LINE(X,Y)-(X,Y),PRESET
300 'generate single bolt portio
n
310 FOR T=1TO RND(13)
320 X(T)=X(T-1)+RND(15)*(((RND(2
)>1)*2)+1)
330 IF X(T)<0THEN X(T)=0
340 X1(T)=X(T)
350 Y(T)=Y(T-1)+RND(10)
360 Y1(T)=Y(T)
370 NEXT T
400 'generate forked portion
410 FOR T=T TO 13
420 X(T)=X(T-1)+RND(10)*(((RND(2
)>1)*2)+1)
430 IF X(T)<0THEN X(T)=0
440 X1(T)=X1(T-1)+RND(10)*(((RND
(2)>1)*2)*+1)
450 IF X1(T)<0THEN X1(T)-0
460 Y(T)=Y(T-1)+RND(10)
470 Y1(T)=Y1(T-1)+RND(10)
480 NEXT T
500 'display lightning flash
510 FOR T=1TO13
520 LINE(X(T-1),Y(T-1))-(X(T),Y(
T)),PSET
530 LINE(X1(T-1),Y1(T-1))-(X1(T)
,Y1(T)),PSET
540 NEXT T
550 FOR S=0TO50:NEXT S
600 'remove lightning from sky
610 '
620 PCLS'use this if nothing
else is on screen, else delete
630 '
640 FOR T=1TO13
650 LINE(X(T-1),Y(T-1))-(X(T),Y(
T)),PRESET
660 LINE(X1(T-1),Y1(T-1))-(X1(T)
,Y1(T)),PRESET
670 NEXT T
680 GOTO200
1000 '
1010 '
1020 'The lightning is generated
      in two arrays, one for eac
h     of two forks,
1030 'Fourteen co-ordintaes are
      generated,X and Y being
      independent of each other.
1040 'The distance between point
s     is randomly generated.
      the horizontal values can
      be + or -, but the vertica
l     values are always +.
1050 'Initially, a random number
      of points are duplicated i
n     both arrays to give the
      impression of a single
      lightning bolt.
1060 'Then, points for each arra
y    are generated to produce
     forked lightning.
```

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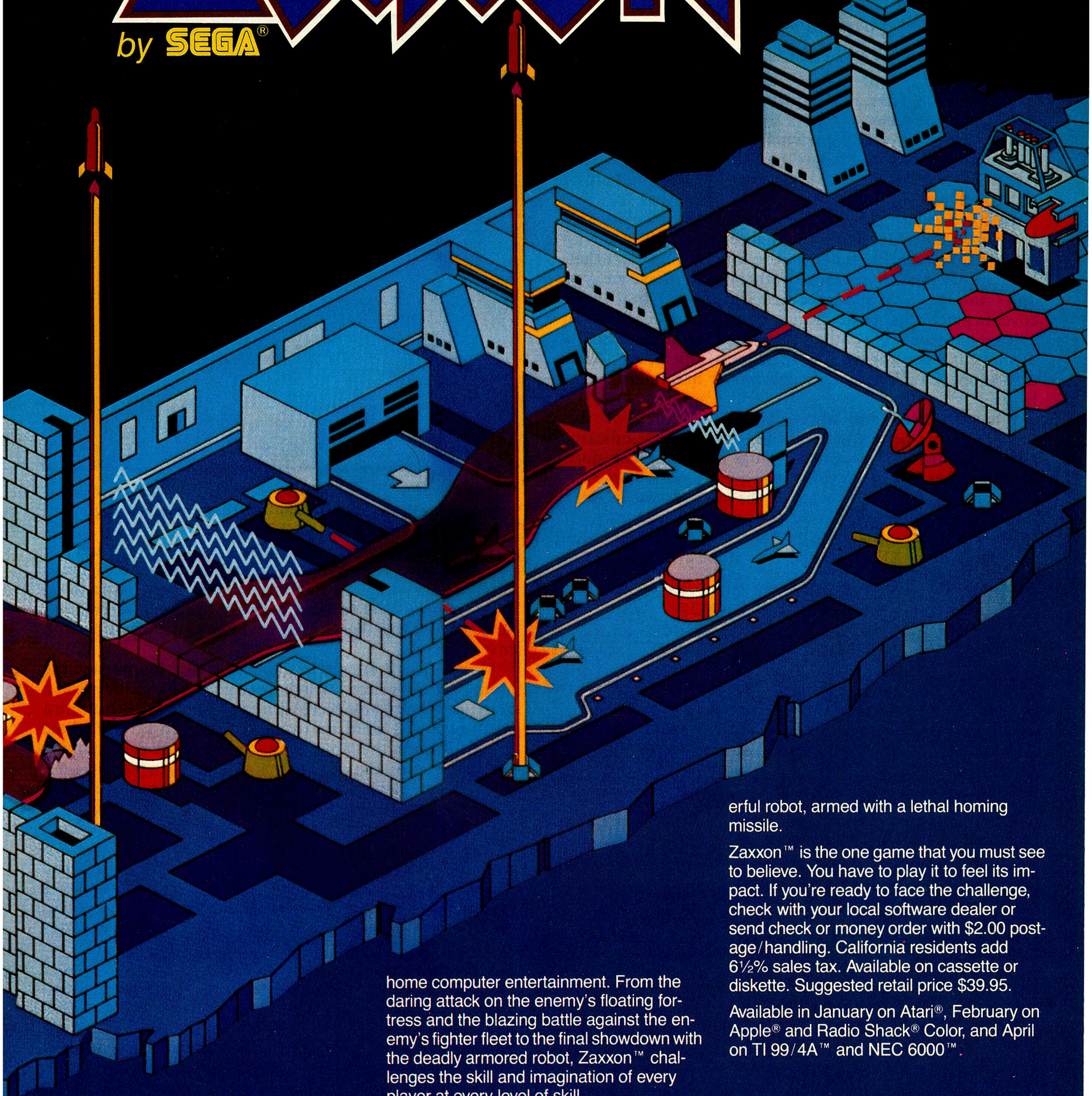

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Install a Chip-Saving 'Power On' Light

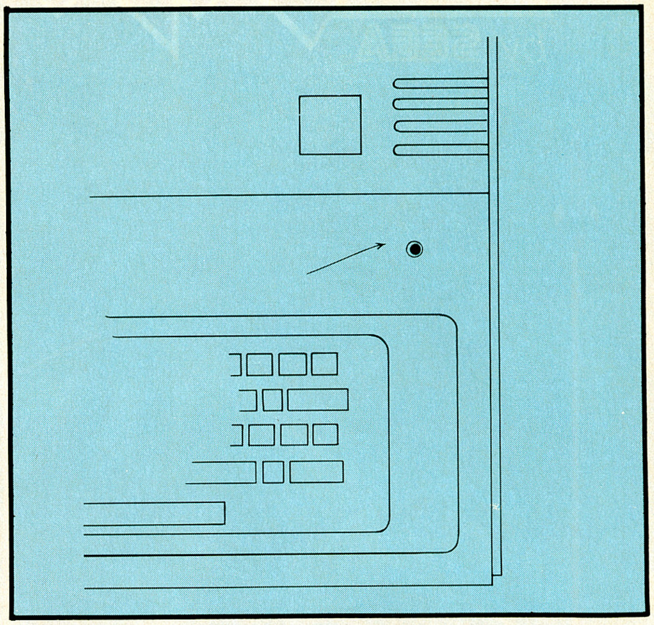
By William C. Clements, Jr.

The Color Computer has a lot of nifty features, but one that it doesn't have is a power-on indicator. Sure, the presence of the green screen on the attached TV will signal you whether the computer switch is turned on, but what if you turn off the TV and forget the computer is on too? That AC switch is hidden on the back, out of the way and out of sight, and it's easy to forget it.

We have seven Color Computers in a student facility here in Chemical and Metallurgical Engineering at the University of Alabama, and the students were forever doing just that. We have the dust covers on all of them, and believe me, you don't want to go off and leave an 80C on overnight with the cover in place. That power transformer gets hot enough even when it has plenty of ventilation, and the SAM chip and the memory ICs get warm under their metal shield, too. After that happened a few times, I decided we had to have pilot lights.

I have noticed one commercial device to solve this problem. It provides a light-emitting diode (LED) indicator lamp mounted in a device that plugs into a joystick port, getting power off the +5 volt line provided there. However, it's easy (and much cheaper) to do the job right and install a first-class pilot lamp inside the case, where it belongs.

Radio Shack sells a pack of two LED indicators (Stock No. 276-018) for $1.79. These lamps come in a neat snap-in housing that requires only a 5/16 inch hole and a little finger pressure to produce an installation that looks just as good as if it came that way from the factory.



You can mount the lamp where you like; I put ours just above the right edge of the keyboard, as shown in Figure 1. Unplug your computer and turn it upside down onto a towel or other protective surface. Remove the seven screws that hold the case together, turn it back over, and lift off the top cover.

Make a small dimple in the plastic case by pressing the point of a nail where the light is to go, then carefully drill a 5/16 inch (8mm) hole there with an electric drill. Start with a small hole and work up to the full size, to keep the hole round. Push in the lamp from the top of the case, making sure it goes in all the way and snaps securely in place. Solder a 1000 ohm, ¼-watt resistor to the longer (positive) lamp lead.

Cut two pieces of insulated flexible wire (I used wire-wrap wire here), each about a foot long, and twist the wires together. Solder one wire to the free end of the resistor and the other wire to the remaining lead of the lamp. Push pieces of insulating tubing over each wire and slide them up next to the lamp casing, pushing over wire, resistor, and all, to cover all exposed metal.

For circuit boards through Revision E, connect the wire from the resistor to the circuit-board wire-wrap pin labeled TP9, which is the +12 volt point, and the other wire to TP4, which is ground. If you have the newest revision of the circuit board (the one with the power transformer mounted on the board and having the small tab-mounted RF shield), the +12v. point is the pad labeled TP3, and ground is the pad labeled TP2.

Reassemble the case, taking care that the wires don't get pinched anywhere, and you have it done. The whole job takes about 20 minutes and costs a total of two dollars, and for that price you even have a spare lamp left over to use for something else. Now you have no excuse for going off and leaving the power on to fry your SAM chip or those brand-new 64K memory upgrades!

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XII
III
VI
IX

CoCo Clock An Accurate Timepiece

By A.B. Trevor
(70000, 130)

One of the advantages in having your own computer is that you can have it *do* things for you, even when you are not sitting in front of it. Of course, your computer must perform these tasks on schedule. But how can your CoCo keep accurate track of time? Its internal time bases are less than one percent accurate—unsuitable for long-term time keeping. At least one manufacturer (Basic Technology) has attempted to solve this problem, but the solution costs more than a CoCo ($379 for a BT-1000 and BT-1020 Clock). Fortunately, a very accurate time base can be obtained for less than $40 from Radio Shack's Plug 'n Power (TM) Remote Controller (Cat. #26-1182). Even if you have no interest in controlling lights and appliances (which this little box does very well), the P 'n P may be a suitable real time clock for your application.

Last month, we looked at the P 'n P hardware and a BASIC program for controlling lights. This month, we shall discuss how to use the P 'n P as a time base in a simple BASIC program (Listing 1) that calls some interesting machine language subroutines. (The sources of these routines are too lengthy to be reproduced here, but are available to *Rainbow* subscribers on CompuServe). There are some limitations to this implementation, so before examining the programs in detail, let's consider some of the problems in implementing an accurate clock in the Color BASIC environment.

As any serious student of CoCo anatomy knows, the 6809 is equipped with three hardware interrupts: the nonmaskable interrupts (NMI), the fast interrupts request (FIRQ), and the normal interrupt request (IRQ). In our favorite machine, the NMI is usable only by cartridges that are so inclined (like the Disk Controller), and the FIRQ is used (wasted?) for detecting the presence of a cartridge. The IRQ, however, can be connected to either one of two "clocks" under program control and used to time events without tying up the whole processor.

Of the two IRQ clocks, the horizontal sync clock (HS) occurs too often (every 63.5 microseconds) to be efficient in a time-of-day clock application. The field sync clock (FS) interrupts every 16.667 milliseconds, so it is the preferred choice for most timing jobs. FS is used by Color BASIC for the SOUND duration, and by ECB for the TIMER function. If you have played with TIMER at all, then you already know why the FS is very limited as a real time clock: it is not exactly 1/60th of a second, and has no long-term accuracy.

The Plug 'n Power controller provides a partial answer. As mentioned in my February article, this device contains a power line frequency detector. Each time the 60 Hz power signis accurate over the long term. Unfortunately, the clock line is connected to the cassette data input, which cannot cause an interrupt in an unmodified machine. An interrupt is tantalizingly available on the RS-232 status line, but if we modified the Plug 'n Power to use the RS-232 port, then where would our printer or modem go? So, with no interrupt available, the CPU must spend a good percentage of the time just watching the cassette data input to maintain an accurate time base using the P 'n P. Well, the solution below is not ideal, but involves no hardware changes.

Dual Time Base

The first time you set the time of day with the *USR1* function (Listing 1), two changes to the BASIC environment are made: 1) a new IRQ service routine is inserted, and 2) BASIC's keyboard-input-wait routine is modified to count pulses from the P 'n P box. If your BASIC main program is executing (or if the P 'n P is off or disconnected), then time is maintained by means of the FS interrupt. Whenever your

BASIC program is not running or is waiting for input from the keyboard, then accurate time keeping with the P 'n P controller is in effect. Accurate time can also be maintained if your program calls *USR2* to wait for a specified time of day. Since most control programs will spend most of the time waiting for keyboard input or for some specific time, little accuracy will be lost by this "dual time base" technique. Considerable time will be lost if your program invokes BASIC functions that turn off the IRQ—notable I/O. Cassette I/O totally shuts down both time bases for the entire transfer period, while disk usually causes the loss of only a few seconds. In any case, this clock is very accurate for many applications, and it is easy to test its accuracy in your own programs, since the time is continuously displayed in the upper right of BASIC's text page.

A magenta colored, non-blinking cursor is used to signal that P 'n P timing is in effect. If you see BASIC's familiar multi-color cursor after running the program, then the P 'n P is not properly connected or is not switched to "CTRL."

Program Description

Listing 1 is a simple BASIC program that loads the clock routines, initializes them, and sets the day and time from your inputs. Once you run it, the day of the week and the time of day will appear continuously in the upper right of the text screen. Be sure that your P 'n P is switched to "CTRL" for maximum accuracy. You can load and run most BASIC programs without destroying the clock.

Two "USR" functions are the heart of the program. *USRO* sets the day of the week from an integer argument (1 = Sunday, 2 = Monday, . . .). *USR1* sets the hour from the high order 8 bits and the minute from the low order 8 bits of the argument. The current day or time can be read by calling with a negative argument. Note that *USR1* returns the time as four BCD digits, which is not the same format used to set time. Once the clock has been set, time is maintained by calls to the machine language TICCLK routine either from the IRQ service routine (IRQULK) or from NEWHK. NEWHK turns off the IRQ clock and sets the cursor to $EF (magenta block). It then loops, looking for pulses on the cassette input line (bit 0 in BSRSTA) or for a key. TICCLK is called once for each pulse seen. If no pulses are seen in a reasonable time, or if a key depression is noticed, the IRQ clock is reenabled and control is returned to BASIC.

A third user callable routine, *USR2,* (not called by this BASIC program), is used to wait for a particular time. It returns with a zero value when the specified time is reached, or with the value of an ASCII character if a key was depressed before the time was reached. If the P 'n P is not turned on, *USR2* returns -1.

The machine language routines are written in position independent code, so may be relocated anywhere in memory. For example, 16K machine owners will want to delete line 80 of Listing 1 and remove the first apostrophe in line 90 to keep the routines within 16K.

All of these routines are used by the full function home control program to be presented in a later article in this series. Once again, this month's programs can be downloaded from ComPuServe. Type "R ACCESS" from the PROgrammer's area, then "DOW PNPCLK.CC 70000,130" for the BASIC program, or "COPY X10CLK.M69 [70000,130]" for the assembly language sources in MAC69 format. Some changes will be required for less powerful assembers such as EDTASM+.

(Alexander B. Trevor is Executive Vice President for Computer Resources at CompuServe.)

The listing:

```
200  01E6
350  03BE
500  0614
END  095C
```

```
10 '****************************
20 '     P'N'P REAL TIME CLOCK
30 '
40 '     (C) A.B. Trevor   1983
50 '
60 '****************************
70 '
80  CLEAR 100,&H7D00:' FOR 32K
90 'CLEAR 100,&H3D00:' FOR 16K
100 ML=PEEK(39)*256+PEEK(40)+1
110 DEFUSR0=ML: DEFUSR1=ML+3: DE
FUSR2=ML+6
115 IF PEEK(ML+445)=127 AND PEEK
(ML+2)=145 THEN 200
120 '
130 'READ IN THE M/L CLOCK
140 CLS: PRINT@138,"LOADING M/L"
150 FOR I=ML TO ML+445
160 READ A: POKE I,A: NEXT I
170 CLS
180 '
190 'SET THE DAY AND TIME
200 INPUT"DAY OF THE WEEK";A$
210 DAY=(INSTR(1,"SUMOTUWETHFRSA
",LEFT$(A$,2))+1)/2
220 X=USR0(DAY)
```

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```
230 INPUT"HOUR:MIN";HR,MIN
240 X=USR1(HR*256+MIN)
250 END
260 '
270 DATA 22,0,145,22,0,159,22,1,
9,22
280 DATA 1,178,79,106,141,0,32,4
6,100,48
290 DATA 141,0,26,134,120,167,13
2,166,130,45
300 DATA 88,139,1,25,167,132,161
,6,45,28
310 DATA 111,132,32,239,255,255,
255,255,255,0
320 DATA 0,7,36,96,96,0,255,0,25
5,0
330 DATA 106,140,242,141,203,110
,156,243,230,140
340 DATA 230,88,88,48,141,0,39,5
8,198,4
350 DATA 206,4,20,189,165,154,48
,140,213,141
360 DATA 10,134,58,167,192,141,4
,134,58,167
370 DATA 192,166,132,68,68,68,68
,138,48,167
380 DATA 192,166,128,132,15,138,
48,167,192,57
390 DATA 19,21,14,32,13,15,14,32
,20,21
400 DATA 5,32,23,5,4,32,20,8,18,
32
410 DATA 6,18,9,32,19,1,20,32,18
9,179
420 DATA 237,77,45,3,231,140,144
,79,230,140
430 DATA 140,189,180,244,57,140,
32,55,190,255
440 DATA 248,238,1,239,140,135,5
1,140,137,239
450 DATA 1,52,2,182,255,3,138,1,
183,255
460 DATA 3,206,1,106,166,196,174
,65,167,141
470 DATA 255,111,175,141,255,108
,134,126,48,141
480 DATA 0,148,167,196,175,65,13
4,18,167,140
490 DATA 200,53,2,189,179,237,77
,45,22,52
500 DATA 4,141,26,231,141,255,65
,53,2,141
510 DATA 18,231,141,255,58,111,1
41,255,55,28
520 DATA 239,236,141,255,47,189,
180,244,57,95
530 DATA 140,203,16,128,10,44,25
0,139,10,52
540 DATA 2,234,224,57,189,179,23
7,52,4,141
550 DATA 234,231,141,0,60,53,2,1
41,226,231
560 DATA 141,0,53,26,16,182,255,
32,133,1
570 DATA 38,249,142,7,208,48,31,
39,44,182
580 DATA 255,32,133,1,39,245,23,
254,205,236
590 DATA 141,254,235,16,163,141,
0,17,39,17
600 DATA 173,159,160,0,39,215,31
,137,79,189
610 DATA 180,244,28,239,57,0,255
,79,95,189
620 DATA 180,244,57,204,255,255,
189,180,244,57
630 DATA 50,98,23,254,204,15,112
,13,111,16
640 DATA 38,0,70,52,20,174,141,2
54,188,191
650 DATA 1,13,134,239,167,159,0,
136,182,255
660 DATA 32,133,1,38,249,142,7,2
08,48,31
670 DATA 39,31,182,255,32,133,1,
39,245,23
680 DATA 254,112,173,159,160,0,3
9,226,198,96
690 DATA 231,159,0,136,48,141,25
4,144,191,1
700 DATA 13,53,148,48,141,254,13
5,191,1,13
710 DATA 126,161,179,126,161,127
```

Y-PAK Dual Slot Expander
for Radio Shack's Color Computer

Have your Disk and Cartridge too!
Select between 2 Cartridge slots with one
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$70.00 Complete

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DO YOU HAVE A BASIC OR ASSEMBLY PROGRAM TO SELL?

. . . avoid unreliable cassette tapes and recorders and EPROM your program!

With EPACK, BASIC and assembly routines for color computer can be read from cassette tape and stored onto 2516, 2716 (single supply), 2732, 2532, 2564 and 2764 styled EPROM (21 and 25 volt). These EPROM are then inserted into MMB, a game packlike cartridge that automatically executes your program when it's inserted into the color computer . . . just like the game packs.

EPACK is an excellent alternative to cassettes for programs you want to sell and for personal programs you would like to execute quickly and conveniently from a more reliable medium.

NOTE: 2732, 2764 and 21 volt capability are available optionally and are **not included** in the standard EPACK. **

EPACK consists of **EPG, BROM** and **MMB** for **$150.00**

The units in EPACK are sold individually as follows:

BROM

Utility fits any memory size color computer. Its function is to process BASIC source files into a format that can be written out to EPROM by Control Craft Inc.'s EPROM programmer (EPG) . . . and still be executed by the BASIC interpreter - but from EPROM, not RAM!

BROM **$25.00**

EPROM PROGRAMMER (EPG)

- Zero insertion force socket
- Personality plugs configure programmer to accept 2716 (5 volt supply), 2532 and 2564 style EPROM.
- Programmer's software is included on the programmer board as firmware.
- Program sources:
  - * read cassette tape files into memory and then write file to EPROM (files are in Radio Shack format)
  - * write color computer RAM to EPROM
  - * read EPROM inserted in programmer into RAM
  - * write color computer ROM to EPROM
- Functions:
  - * test EPROM to see if it's unprogrammed
  - * read an EPROM into color computer RAM
  - * write RAM buffer out to EPROM
  - * redefine the location of the RAM buffer
  - * verify the programming of an EPROM
  - * compare the contents of RAM buffer against an EPROM
  - * edit the RAM buffer
    1. Examine/change memory locations
    2. Examine/change start buffer address
    3. Fill RAM buffer with FF hex
  - * read blocks from a cassette file into RAM
- Menu driven operation allows easy use
- Plastic case enclosed circuitry
- Gold plated edge connectors
- Self-contained unit . . . no external power supplies are used
- Unit operates on any memory sized TRS-80 color computer

EPG **$105.00**

MULTI MEMORY BOARD (MMB)

- Complete with support IC, sockets and decoupling capacitors
- Accepts 2516, 2716, 2532, 2732, 2564 EPROM (included in EPACK)
- Accepts 2016, 4016, 6116 static RAM*
- Max capacity of 6 memory chips
- Runs on any size TRS-80 color computer
- Board is jumper addressable to either $C000 or $8000
- Provisions for write protect switch, or can jumper the board to write protect RAM
- Jumpers configure the memory type used on the board. Provisions for inserting DIP switches in place of the jumpers
- Gold plated edge connector
- Each IC or IC socket has decoupling cap installed
- Plastic case is available extra, at $7.50 (pricing is subject to change without notice) (case included in EPACK)

* RAM may not work with series E or later color computers.

MMB **$30.00**

** **UPGRADE** (optional for EPACK or EPG)

2732-25 volt	**$15.00**	2732-21 volt	**$15.00**
2764-25 volt	**$15.00**	2764-21 volt	**$15.00**

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OKIDATA owners know that in order to print graphics they lose their serial interface . . .

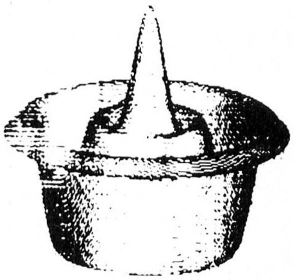
NOT ANY MORE!

Now you can print Hi-res Pmode 4 graphics images, full size and detail, on your OKIDATA, EPSON and other printers, without dot addressable capacity.

Features:

- Callable from BASIC routine
- Runs stand alone with a menu
- Relocatable
- Automatically finds the start of graphics pages
- Configurable for several printers
- Fast
- Useable on 16 or 32 or 64 K machines with or without Extended BASIC
- Documented

(OKIDATA, EPSON and RS are trademarks)



Actual graphics printed on an OKIDATA printer (shown reduced)

SDUMP **$20.00**

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____

____

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EPG	_____	@	$105.00 =	_______
MMB	_____	@	$ 30.00 =	_______
SDUMP	_____	@	$ 25.00 =	_______
UPGRADE NO.	_______	@	$ 15.00 =	_______

Wis. residents add 5% sales tax _______

Shipping & Handling: # of items _____ x $2.00/item = _______

TOTAL ORDER: $ _________

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Software Review . . .

Race Or Demolition Derby— It Still Gets High Marks

The KAGRG gives *Space Race*, by Spectral Associates, very high marks for action, graphics and sound. We've stepped beyond the "graphics compare favorably with arcade games" stage with this one and are now in direct competition.

So who is this KAGRG? They are the videogame experts—at least in my house. The Knight Arcade Game Review Group consists of one 15-year old son, one 13-year old daughter, and—at least in this case—one wife, over 21. I use my 6809 machine for word processing and data storage, seldom do I venture into saving the cosmos from alien eradication.

I did have a go at *Space Race*, which in my case was more of a demolition derby. I was not quite good enough to be erratic, but if they gave points for kamikaze attacks I might have had a respectable score. Nimble my fingers ain't.

The Group was impressed. As a machine language program—which requires 16K but not Extended BASIC—it's extremely fast. Your highly maneuverable craft speeds around the rectangular "track" avoiding motionless Mines, floating Collectors, missiles from the Swarmers and the concerted attack of the Berserkers.

There is more going on in this game than in the parking lot at the Superbowl. Why you can even design a family handicapping system to give everyone a chance at the championship of the known universe—until the power goes off and all the scores are lost, that is.

When you first *EXECute* the program it tries to make friends by asking your name. Then it wants to know if you want keyboard or joysticks (we started with keyboard but quickly gave up—it's a lot easier to have the joystick think for you). Then it wants to know what skill level you want. With the options from 0 to 15, you have plenty of room to grow. Without exception the Group started with 1—I tried out the 0.

You are given a squadron of four ships and the various alien items pay from 25 to 600 points if you shoot 'em down. There is no time limit but the speed at which you are attacked makes the play go very fast. If you kill a Swarmer, a Collector becomes a Swarmer and if you leave a Swarmer alone too long it becomes a Berserker and immediately attacks you.

Clearing the screen of bad guys gets you another batch of bad guys—except that they get increasingly harder to shoot down. Higher level Collectors have to be shot twice and at the highest level the race track "infield" goes away leaving you no place to hide. At this point it's a literal free-for-all. For each 10,000 points scored you get another ship (with a limit of five at any one time), but your skill level is automatically advanced by two.

If (more like when) you lose your entire squadron the program displays the nine highest scores during that power-up period and asks if you want to play again. Pressing Y will get you another squadron at your original level and a new game.

The N gives someone else a chance to play as it goes back to the main menu and asks for name, skill level and joystick or keyboard.

The high score chart shows the name of the player, his or her score and the level at which it was earned. With basic handicapping skills you could even out the competition for all players.

While the game is designed to be played with joysticks or keyboard, we found that the keyboard required more personal memory than any of us was willing to provide. Trying to remember that "1" is counterclockwise rotation, right arrow was fire, left was thrust and clear was reverse made us thankful for joysticks. I would guess the ultimate competition to be a level 15 battle with keyboard on about the sixth wave of enemy.

The game is a winner for action lovers. In fact, even I got hooked on it, and I generally do not like shoot-'em-ups. The KAGRG couldn't even suggest where improvements could be made.

But the documentation could be improved. It is all there, even disk save instructions, but the presentation is not very logical. For instance, I found the loading instructions about two-thirds of the way down the page after the play instructions.

I'm renowned as a videogame cynic, and the worst I can say is that the instructions are illogical—this must be a good one.

(Spectral Associates Inc., 141 Harvard Ave., Tacoma, WA 98466)

—Glenn B. Knight

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--SPECTACULATOR TO ASCII--

--ASCII TO SPECTACULATOR--

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Run Spectaculator On Data Files Created
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Spectran is a easy to use program for unleashing the power of Disk Spectaculator. ML makes it quick. Works with ASCII compatible WP programs on 16K or 32K Disk systems. Use spreadsheet tables in your reports. Use downloaded data in Spectaculator. Easy to follow manual with examples. On diskette for $25.00 postpaid.

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A Radio Shack exclusive! Unless you complete three levels of eerie play, you don't stand a "ghost" of a chance of rescuing Carol Anne! First you must discover the clues. Next climb the hazardous stairs. Then it's time to destroy the poltergeist—if you can! (Cat. No. 26-3073, $34.95)

Enjoy these exciting games with Radio Shack's TRS-80 Color Computer (26-3004, $299.95) and joystick controllers (26-3008, $24.95). Attaches to any TV (not included).

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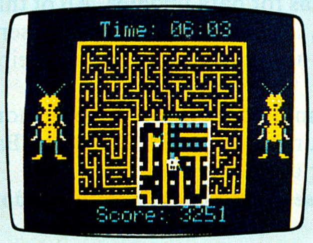
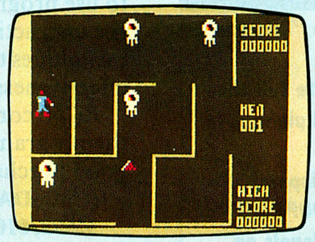
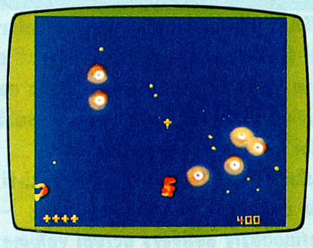


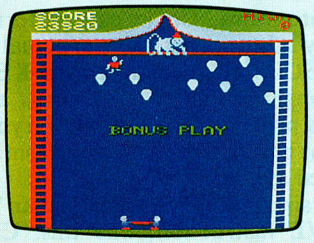
Mega-Bug. It's a maze of fun as you try to lose and confuse the little "buggers" hot on your trail! (26-3076, $34.95)



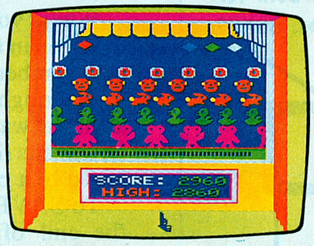
Monster Maze. Thread your way through an evil dungeon to find the gold. Beware of laser-firing monsters! (26-3081, $29.95)



Microbes. You're the disinfector, shooting antibiotics at deadly germs. 15 levels of nasty difficulty. (26-3085, $24.95)



Clowns and Balloons. Bounce a "monkey-suited" clown high enough off the net to pop the balloons above. (26-3087, $29.95)



Shooting Gallery. Hit moving targets for points in a whimsical carnival atmosphere. Lots of surprises! (26-3088, $29.95)

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Software Review . . .

ECM: Your Money's Worth And A Basic Bonus

ECM, Electricity Consumption Monitor, from CoCoDATA Enterprises offers a lot more than the advertisements suggest. In addition to a very neat, compact energy monitoring routine, it offers a few nice BASIC programming techniques.

The ads that offer full refund if not completely satisified offer some comfort in purchasing software through the mail. This is the claim of CoCoDATA for their product ECM. They should have very few claims for refunds.

The documentation leads you through the setup very painlessly. It even includes a short course on reading your electric meter. This is the part your computer won't do for you.

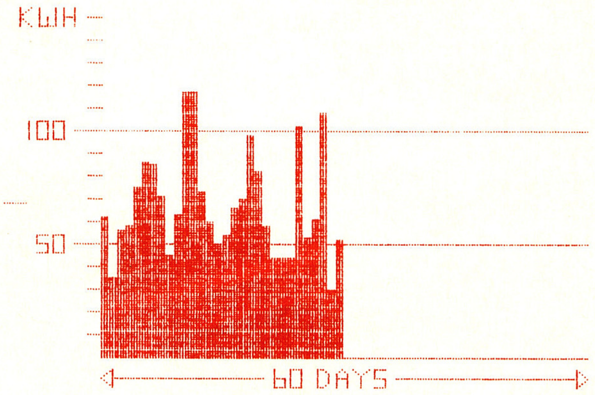
The program uses the information from your utility bill and from daily readings you make of your electric meter. This information must be placed in the body of the program, following the format guidlines provided in the instructions. The billing information is listed in the program as Line 200 BI$(1)=date, consumption & amount.

The meter readings are entered as Line 100DATA date & meter reading. The program has sufficient line space set up for one year without modification of the program. The author has chosen this method of data storage to eliminate the use of a separate data file tape.

Once the information is entered in the program, *RUN* and computed, you are presented with a menu to select: (1) 30 days consumption in dollars or KWH, (2) Graph of last 60 days use or (3) Next months bill projected with 20 day trend analysis.

Selecting item one will provide a screen list of the electricity usage by date in terms of dollars or KWH. It will also calculate the high, low and average use for those 30 days.

Item two presents a nice hi-res bar graph for a 60 day period. The graph can be dumped to the printer using one of the many screen print routines available such as the one from Custom Software Engineering. The graph has a unique feature in that it marks the average value of all plots with a tic mark just left of the vertical axis.



Item (3) will display a trend analysis indicating a percentage increase or decrease in consumption.

The extras you get with the program are the author's programming techniques. You can learn how he handles dated information or draw a nifty little bar graph or how he does a trend analysis or how to select ranges in data or how to use program insertions for data updates. All of this, plus the instruction booklet, includes a few energy conservation techniques that you can apply and then monitor their actual effectiveness.

ECM comes with sample data included to demonstrate the program and will run on 16 or 32K Extended Basic. A good purchase for your utility library.

(CoCoDATA Enterprises, 1215 Emeralda Dr., Orlando, FL 32808, $10.45 cassette)

—Ed Sehlhorst

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- **The KALEIDOPHONE allows your Color Computer to "listen to" your hi-fi and display what it "hears" on your TV!**
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KALEIDOPHONE

Hint . . .

Saving In ASCII

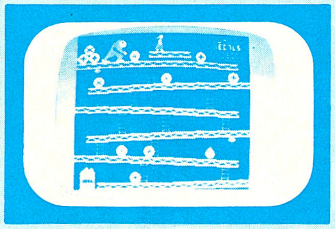
When you SAVE programs, CoCo can perform this function in two ways, by using binary codes or actual letters and numbers (called ASCII and pronounced AS-KEY).

Although it takes longer, ASCII sometimes is a more accurate way to SAVE a program, especially when you may be transferring programs between systems—say from a disk-based to a cassette-based system.

To SAVE in ASCII, simple add a comma and an "A" to the end of your SAVE instruction, like this: CSAVE "PROGRAM",A and the ASCII SAVE will be done by CoCo.

TOM MIX SOFTWARE

•FOR THE COLOR COMPUTER & TDP 100 • 3424 College N.E., Grand Rapids, MI 49505 (616) 364-4791•

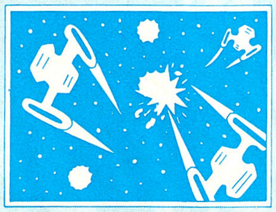


THE KING

1982
32K Machine Language
$26.95 tape
$29.95 disk

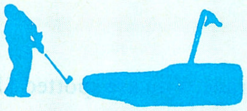
ARCADE ACTION - How high can you climb? Four full graphic screens. Exciting Sound - Realistic graphics. Never before has the color computer seen a game like this. Early reviews say: Just like the arcade - Simply outstanding!

PROTECTORS



Exciting fast paced arcade game that looks and plays like the popular arcade game "DEFENDER",
Wave after wave of enemy fighters drop bombs on your city. Destroy them before they destroy your city. Soon the mother ships appear firing laser blasts at you. Watch for the heat seeking mines.
Your defense includes your laser cannon plus four smart bombs on each of your four ships. A new ship with each 5,000 points.
High resolution graphics with four colors make this new 32K arcade game the one for others to follow.

$24.95 TAPE $27.95 DISK



COLOR GOLF

Now sit at your computer and play nine or eighteen holes. Outstanding graphics in the fairway or on the green. Helps your game.
32K EXTENDED BASIC **$17.95**

BIRD ATTACK-A fast paced machine language arcade game. Shoot the birdmen before they descend upon you. Watch out for their bombs! **16K Machine Language** **$21.95**

MAZE RACE-Maze race is a one or two player game. Play either against the built in timer or against your favorite opponent. **16K Machine Code** **$17.95**

SOLO POOL-Now play pool with your color computer. Two players. Plays like machine language. Super color. High resolution graphics. **16K Ext. Basic** $17.95

OTHER GREAT GAMES

ALL PROGRAMS REQUIRE 16K

MOON LANDER•Fantastic Graphics. Land on the Moon if you can. 2 Programs. Ext. Basic $17.95

DANCING DEVIL•Watch him dance to music or program him yourself. Machine Language. $14.95

WAR KINGS•Battle to save your castle and king. High resolution graphics with outstanding sound make this one a real winner. 16K Machine Language $17.95

ADVENTURES

TREK-16-Travel thru space with Spock and Capt. Kirk. Adventure. Tough! Ext. Basic. $17.95

SHIPWRECK-Escape from a desert isle if you can. Great Adventure! Ext. Basic. $14.95

ESCAPE FROM SPECTRE (Graphic Adventure)-You are a secret agent for British Intelligence sent on a mission to obtain the secret nerve gas formula being developed by S.P.E.C.T.R.E. to destroy the world. **16K Ext. Basic** $17.95

NEW

SPACE SHUTTLE

$28.95 TAPE ONLY

1983
32K Ext. Basic

This program gives you the real feeling of flight. Full instrumentation complete to the max. Actual simulation of space flight. **32K Ext. Basic**

NEW

TRAP FALL by Ken Kalish

The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King". Requires 16K
Tape **27.95**

KATERPILLAR ATTACK

Outstanding graphics and sound will end all of those trips to the arcade. So much like the arcade you have to see it to believe it. Requires Ext. Basic.
16K MACHINE LANGUAGE **$21.95**
DISK **$24.95**

UTILITIES

COLOR MONITOR-Written in position independent code. (May be located in any free memory). Very compact. Only occupies 1174 bytes of memory. Full Featured. Includes Break-Pointing of machine language programs, register display and modify, memory display and modify, and block memory move commands. Displays memory in hex and ascii format on one line 8 bytes long. **MACHINE LANGUAGE $24.95**

ROM-This program is a utility that will move "most" 8K Rom-Packs to disk and allow you to run them from disk. Easy to use. Requires 64K. **$17.95**

SCREEN PRINT ROUTINE-Using your Epson or Microline Printer. Print the screen contents on a full size 8½ x 11 sheet. 16K Ext. Basic **$17.95**

TAPE DUPE—Brand new machine language program that copies any tape effortlessly. Completely automatic. **$16.95**

DISK TO TAPE-Dump the contents of any disk to tape automatically. Machine Language. **$17.95**

TAPE TO DISK-Load the contents of any tape to disk automatically. Machine Language. **$17.95**

MAIL LIST-Maintain a complete mailing list with phone numbers etc. Ext. Basic. **$17.95**

THE FIXER-Having trouble moving those 600 Hex progams to disk? The fixer will help. Completely automatic. **$17.95**

TAPE CAT-All new machine language program lists contents of tapes to printer. Make a catalog of your tapes. **$17.95**

PROGRAM PRINTER UTILITY-This program will list basic programs to your printer in two column format. Saves paper and makes your listing look professional. Disk based. **$17.95**

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SEE YOU AT RAINBOW FEST

The Horses Are Nearing The Starting Gate...

Program by
Rob Becker

Now that springtime has gotten a good foothold around and about, the thoughts of some young innocents have turned to that traditional befuddler of mind and body chemistry called love. But the stars in the eyes of many another older (but not wiser) head are there in anticipation of the season's parimutuel betting which will be taking place on the grounds of this nation's many venerable ovals.

Particularly, on the first Saturday of May, the attention of sporting-minded folk around the world will be focused on a patch of turf in the heart of Louisville, which for over a century has hosted the world's premier horse race, the ultimate championship for three-year-old thoroughbreds, the Kentucky Derby.

The track, of course, is Churchill Downs. And the excitement that spring day will be shared on the grounds by a community of over 150,000 novices, pros, horsemen, innocents and touts—all reaching for the gold ring: that winning parimutuel ticket on the big one.

Whether or not you are so fortunate as to be at "the Track" that day, we have here a little racing program in honor of the Kentucky Derby with which you might want to test your luck. Rob Becker, of Smithtown, New York, didn't write this program specifically for the Derby, but at this time in Kentucky when folks have just polished up their silver julep cups and dusted off their worn copies of Irvin S. Cobb's recipe for muddled mint and Bourbon, it's the only race that comes to mind.

The program accepts win, place and show betting, and allows you to make your pick from an eight-horse field. The day's 'card' contains 10 races, and you may bet any amount up to your total holdings on any race. You are spotted $100 at post time.

The program is self-prompting, but . . . pssst . . . before you go trackside, let me give you a tip: play the filly—she'll run her heart out.

—Courtney Noe

80	03EB
210	0747
310	0B30
430	0F5D
END	1534

The listing:

```
1 ' *** HORSE RACING ***
2 ' BY ROB BECKER
10 BL$=CHR$(128):B1$="horse":B2$
="racing":B3$="by":B4$="rob":B5$
="becker":FORX=1TO15:CL=RND(8):C
LS(CL):PRINT@106,B1$;BL$;B2$;:SO
UNDX*3,1:NEXT:CLS0:PRINT@106,B1$
;BL$;B2$;:PRINT@265,B3$;BL$;BL$;
B4$;BL$;B5$;:SCREEN0,1
20 HT=0:FORJK=1TO7:HT=HT+16:H$(J
K)=CHR$(143+HT):NEXT:H$(8)="G":H
C=0:FORHN=1TO7:HC=HC+16:H1$(HN)=
CHR$(128)+CHR$(131+HC)+CHR$(142+
HC):H2$(HN)=CHR$(128)+CHR$(136+H
C)+CHR$(136+HC):NEXT:H1$(8)=CHR$
(128)+CHR$(131)+CHR$(142)
30 FORX=160TO189:PRINT@X,H1$(7);
:PRINT@X+32,H2$(7);:SCREEN0,1:FO
RY=1TO100:NEXTY:NEXTX
40 H3$=CHR$(128)+CHR$(128):H4$=C
HR$(128)+CHR$(128):H2$(8)=CHR$(1
28)+CHR$(136)+CHR$(136):POKE6549
5,0:CLS:PRINT"*** HORSE RACING *
**":PRINT"BY ROB BECKER":PRINT:I
NPUT"DO YOU WANT INSTRUCTIONS";I
$:IFI$="Y"THENGOSUB410
50 PRINT:INPUT"HOW MANY PLAYERS(
1-8)";PL:IFPL<1 OR PL>8THEN50ELS
EFORX=1TOPL:DD(X)=100:NEXT
60 FORX=1TOPL:PRINT:PRINT"BETTER
";X;"'S NAME";:INPUTA$(X):NEXT
70 IFRA=10THEN320ELSEFORX=1TO8:M
V=RND(7):H(X)=MV:NEXTX:CLS0:RA=R
A+1:PRINT"*** HORSE RACING ***":
PRINT"RACE #";RA:PRINT"HORSES"
80 FORX=1TO8:P=RND(0):SH=RND(0):
P=P+1:SH=SH+2:PRINTX") ";H$(X);"
 ";:PRINTUSING"$##.##";H(X);:PRI
NT" ";:PRINTUSING"$##.##";H(X)/P
;:PRINT" ";:PRINTUSING"$##.##";H
(X)/SH:NEXT
90 IFRA>1THEN100ELSEFORX=1TOPL:G
OTO140
100 PRINT@41,"*":PRINT@73,"*":PR
INT@43,"RESULTS OF RACE #";RA-1:
PRINT@75,"1ST. ";H$(HP(1));" 2ND
. ";H$(HP(2));" 3RD. ";H$(HP(3))
:PA=0:FORX=1TOPL
110 IFDD(X)=<0THENNEXTX
120 FORI=1TOPL:IFDD(I)>0THEN140E
LSENEXTI
130 GOTO320
140 PRINT@384,A$(X)"'S BET":PRIN
T"YOU HAVE ";:IFDD(X)<100THENPRI
NTUSING"$###.##";DD(X)ELSEPRINTU
SING"$ ###.##";DD(X)
150 FORS=448TO479:PRINT@S,CHR$(1
43);:NEXTS:PRINT@448,"WHICH HORS
E";:INPUTBB(X):IFBB(X)>8 OR BB(X
)<1THEN140
160 PRINT@448,"1-WIN 2-PLACE 3-S
HOW";:INPUTWS(X):IFWS(X)<1 OR WS
(X)>3THEN160
170 FORY=448TO479:PRINT@Y,CHR$(1
43);:NEXTY:PRINT@448,"MONEY(1-";
:PRINTUSING"###.##";DD(X);:PRINT
")";:INPUTMN(X):IFMN(X)<.01 OR M
N(X)>DD(X)THEN170ELSENEXTX
180 CLS0:FORX=62TO63:FORY=0TO31:
SET(X,Y,5):NEXTY,X:L=0:FORX=0TO5
11STEP64:L=L+1:PRINT@X,H1$(L);:P
RINT@X+32,H2$(L);:NEXT
190 FORX=1TO1000:NEXT:PLAY"L4T5O
2CFAO3L8CT7P8CP64CP64CP8O2T5L8AT
7P8AP64AP64AP8T5L8.FO3CO2FL1CL4P
2CFAO3L8CT7P8CP64CP64CP8O2T5L8AT
7P8AP64AP64AP8T5L8.CP64CP64CL1F"
200 A=0:B=128:C=192:D=256:E=320:
F=384:G=448:HH=64
210 X=RND(8)
220 ON X GOTO 230,240,250,260,27
0,280,290,300
230 IFA=29THENPRINT@A+1,H3$;:PRI
NT@A+33,H4$;:GOTO210ELSEIFX=1THE
NS=RND(8):IFS<H(1)THEN210ELSEA=A
+1:PRINT@A,H1$(1);:PRINT@A+32,H2
$(1);:IFA=29THENZC=1:GOSUB400
240 IFHH=93THENPRINT@HH+1,H3$;:P
RINT@HH+33,H4$;:GOTO210ELSEIFX=2
THENS=RND(8):IFS<H(2)THEN210ELSE
HH=HH+1:PRINT@HH,H1$(2);:PRINT@H
H+32,H2$(2);:IFHH=93THENZC=2:GOS
UB400
250 IFB=157THENPRINT@B+1,H3$;:PR
INT@B+33,H4$;:GOTO210ELSEIFX=3TH
ENS=RND(8):IFS<H(3)THEN210ELSEB=
B+1:PRINT@B,H1$(3);:PRINT@B+32,H
2$(3);:IFB=157THENZC=3:GOSUB400
260 IFC=221THENPRINT@C+1,H3$;:PR
INT@C+33,H4$;:GOTO210ELSEIFX=4TH
ENS=RND(8):IFS<H(4)THEN210ELSEC=
C+1:PRINT@C,H1$(4);:PRINT@C+32,H
```

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ColorZAP uses the power of the Color Computer to provide both rapid scanning and full screen modification capabilities.

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- **Copy sectors to same or different drive.**
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About the manual: "A 24-page manual is included that describes program operation in detail. It also provides valuable information on the important disk system parameters." — MICRO, December 1982

For the TRS-80 Color Computer. Available on disk with an accompanying manual from **Software Options,** 19 Rector Street, New York, N.Y. 10006. 212-785-8285. **Toll-free order line: 800-221-1624.** Price: $49.95 (plus $2.00 per order shipping and handling). New York State residents add sales tax. Visa/Mastercard accepted.

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```
2$(4);:IFC=221THENZC=4:GOSUB400
270 IFD=285THENPRINT@D+1,H3$;:PR
INT@D+33,H4$;:GOTO210ELSEIFX=5TH
ENS=RND(8):IFS<H(5)THEN210ELSED=
D+1:PRINT@D,H1$(5);:PRINT@D+32,H
2$(5);:IFD=285THENZC=5:GOSUB400
280 IFE=349THENPRINT@E+1,H3$;:PR
INT@E+33,H4$;:GOTO210ELSEIFX=6TH
ENS=RND(8):IFS<H(6)THEN210ELSEE=
E+1:PRINT@E,H1$(6);:PRINT@E+32,H
2$(6);:IFE=349THENZC=6:GOSUB400
290 IFF=413THENPRINT@F+1,H3$;:PR
INT@F+33,H4$;:GOTO210ELSEIFX=7TH
ENS=RND(8):IFS<H(7)THEN210ELSEF=
F+1:PRINT@F,H1$(7);:PRINT@F+32,H
2$(7);:IFF=413THENZC=7:GOSUB400
300 IFG=476THENPRINT@G+1,H3$;:PR
INT@G+33,H4$;:GOTO210ELSEIFX=8TH
ENS=RND(8):IFS<H(8)THEN210ELSEG=
G+1:PRINT@G,H1$(8);:PRINT@G+32,H
2$(8);:IFG=476THENZC=8:GOSUB400
310 GOTO210
320 CLS:PRINT"*** HORSE RACING *
**":PRINT"GAME OVER":PRINT:PRINT
"FINAL SCORES :":PRINT:FORY=1TO8
00:NEXT:FORX=1TOPL:PRINTA$(X);"
$";DD(X):FORY=1TO800:NEXTY:NEXTX
:END
330 FORQ=1TOPL:IFWS(Q)=1THEN340E
LSEIFWS(Q)=2THEN360ELSE380
340 IFBB(Q)=HP(1)THENDD(Q)=DD(Q)
+MN(Q)*H(BB(Q))/2ELSEDD(Q)=DD(Q)
-MN(Q):NEXTQ:GOTO70
350 NEXTQ:GOTO70
360 IFBB(Q)=HP(1) OR BB(Q)=HP(2)
THENDD(Q)=DD(Q)+MN(Q)*H(BB(Q))/P
/2ELSEDD(Q)=DD(Q)-MN(Q):NEXTQ:GO
TO70
370 NEXTQ:GOTO70
380 IFBB(Q)=HP(1) OR BB(Q)=HP(2)
 OR BB(Q)=HP(3)THENDD(Q)=DD(Q)+M
N(Q)*H(BB(Q))/SH/2ELSEDD(Q)=DD(Q
)-MN(Q):NEXTQ:GOTO70
390 NEXTQ:GOTO70
400 PA=PA+1:HP(PA)=ZC:IFPA=>3THE
N330ELSERETURN
410 CLS:PRINT"*** HORSE RACING *
**":PRINT:PRINT" YOU ARE GIVEN $
100 TO START    OFF THE GAME. ON
CE THE GAME HAS STARTED, YOU WIL
L SEE THE LIST  OF HORSES, AND H
OW MUCH THEY    PAY OFF."
420 PRINT" EACH HORSE IS NUMBERE
D, SO      WHEN YOU CHOOSE THE HO
RSE YOU    WISH TO BET ON, TYPE T
HE NUMBER THAT REPRESENTS THAT H
ORSE.      YOUR HORSE IS IDENTIFI
ED BY      IT'S COLOR. 'G' REPRES
ENTS       GREEN ON THE CHART."
430 A$=INKEY$:IFA$=""THEN430ELSE
```

FINALLY!

A REAL SPREAD-SHEET PROGRAM FOR THE COLOR COMPUTER

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Known as the Program Stacker, UP-1 allows several programs to be loaded until the memory is filled. Quickly jump from one program to another or compose new programs while retaining the old ones. Programs are included for patching damaged programs. Allows data or machine language programs to be stored and retrieved from a cassette. Programs are included for writing values or characters to memory, and displaying memory contents. Blocks of memory can be relocated. UP-1 can be used as a Word Processor by allowing text to be stored in memory and printed on the screen or an external printer. UP-1 Cassette $14.95.

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```
CLS:PRINT" THE ROWS OF PRICES, R
EPRESENT  THE AMOUNT OF MONEY YO
U WIN FOR THAT HORSE. ROW 1 TELL
S YOU HOW MUCH MONEY YOU WIN, IF
 YOUR     HORSE COMES IN FIRST."
440 PRINT" ROW 2 TELLS YOU HOW M
UCH YOU   WIN IF YOUR HORSE COME
S IN 1ST. OR 2ND. AND ROW 3 TELL
S YOU HOW MUCH MONEY IF YOUR HOR
SE        FINISHES 1ST,2ND OR 3R
D."
450 A$=INKEY$:IFA$=""THEN450ELSE
CLS:PRINT" DURING THE TIME YOU A
RE ASKED  TO BET ON HORSE, YOU A
RE ASKED  TO CHOOSE WIN, PLACE O
R SHOW.   I WILL DESCRIBE THIS P
ROCEDURE."
460 PRINT" WIN-- IF YOU CHOOSE W
IN, YOUR  HORSE MUST FINISH FIRS
T. FOR    EVERY $2 YOU BET YOU R
ECIEVE    THE AMOUNT OF MONEY TH
AT YOUR   HORSE PAYS FOR A WIN.
IF YOUR   HORSE DOES NOT FINISH
FIRST,    YOU LOSE THE AMOUNT OF
 MONEY YOUBET."
470 A$=INKEY$:IFA$=""THEN470ELSE
CLS:PRINT" PLACE-- IF YOU CHOOSE
 PLACE    YOUR HORSE MUST COME I
N FIRST   OR SECOND. ALL THE OTH
ER        PROCEDURES FOLLOW THE
SAME RULE AS 'WIN'.":PRINT" SHOW
-- YOUR HORSE MUST FINISH  1ST,
2ND, OR 3RD."
480 PRINT"ALL OF THE REST OF THE
          PROCEDURES ARE THE SAM
E AS 'WIN'AND 'PLACE'"
490 A$=INKEY$:IFA$=""THEN490ELSE
CLS:PRINT" REMEMBER : YOU WIN MO
RE MONEY  IF YOU CHOOSE 'WIN' AN
D YOUR    HORSE COMES IN FIRST,
BUT YOU   WIN MORE OFTEN CHOOSIN
G 'PLACE' OR 'SHOW'. ALSO, A HOR
SES SPEED DEPENDS ON HOW MUCH A
HORSE PAYSOFF."
500 PRINT" A HORSE THAT PAYS OFF
 $3, IS   FASTER THAN A HORSE TH
AT PAYS   OFF $6. THE LOWER THE
HORSE PAYSOFF, THE FASTER THE HO
RSE IS.   IF YOU RUN OUT OF MONE
Y, YOU    LOSE, AND YOU ARE OUT
OF THE    GAME."
510 A$=INKEY$:IFA$=""THEN510ELSE
CLS:PRINT" IF THERE ARE ANY OTHE
R PLAYERS IN THE GAME, THE GAME
CONTINUES.AFTER 10 RACES THE GAM
E IS OVER AND EVERYONES MONEY LE
FT IS     SHOWN. YOU CAN NOT BET
 MORE     MONEY THEN YOU HAVE."
520 RETURN
```

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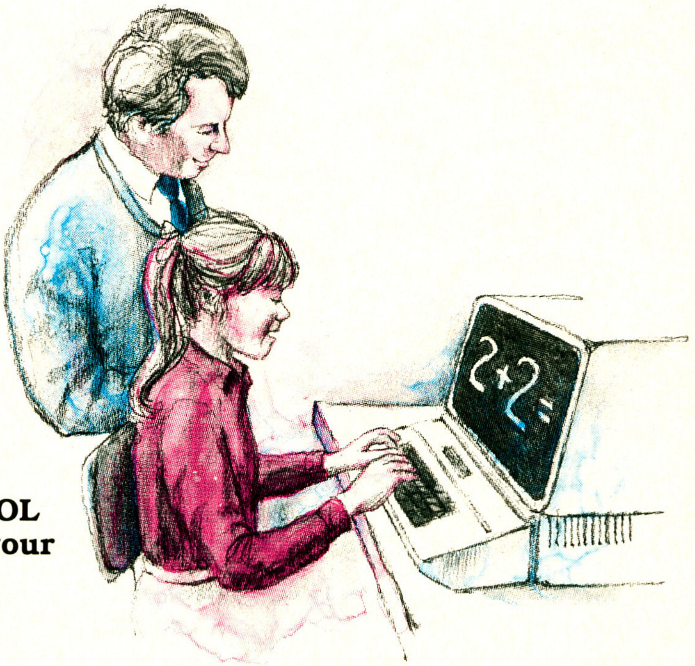

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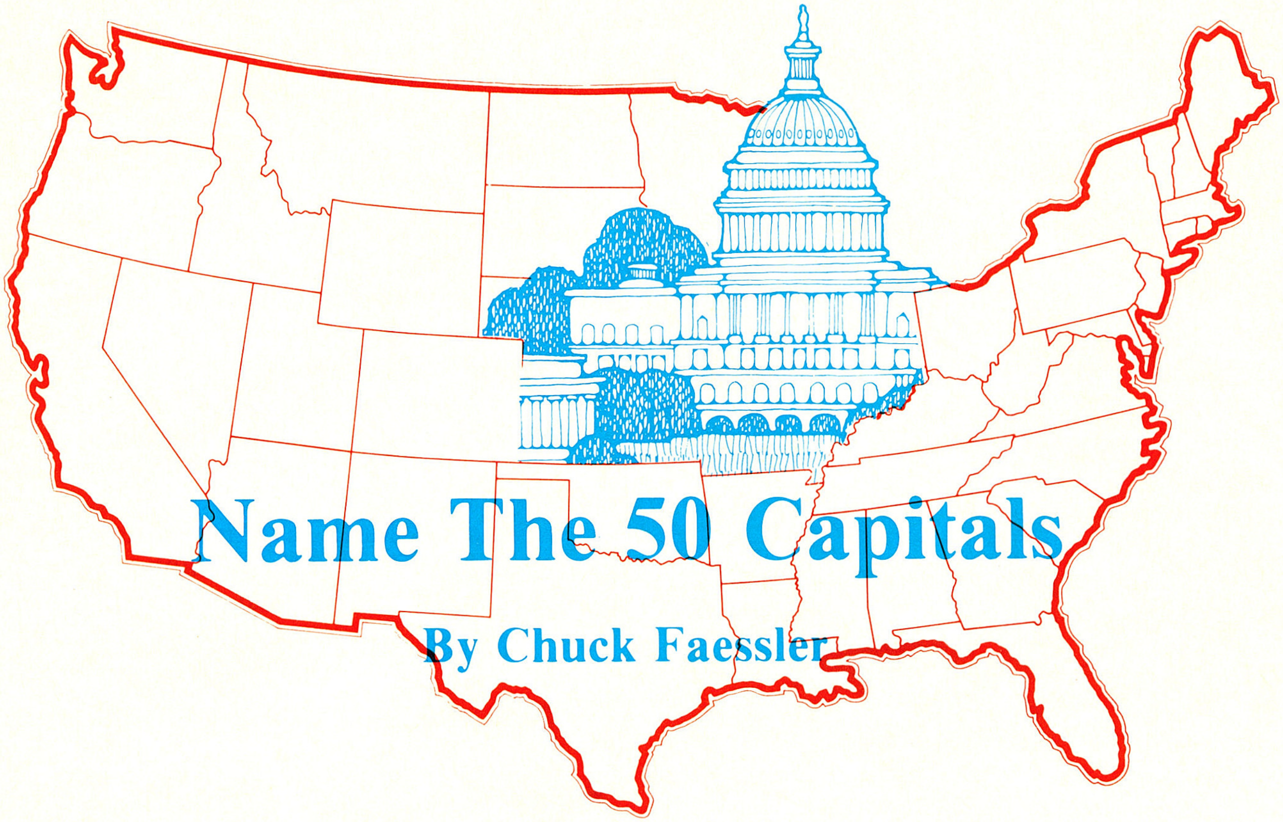
Pop Quiz



Name The 50 Capitals

By Chuck Faessler

States and Capitals is a short program which may be helpful with your children's homework. It is a question and answer drill to aid in the learning of all 50 states and capitals. It also can be easily modified to be used with other question-answer drills.

After the basic program is loaded with *CLOAD*, type *RUN*. The instructions are then displayed along with the first question. If the answer is correct, another question will be displayed. The computer allows you two chances to answer the question correctly; if you are wrong on both tries, it will display the answer and then repeat the question. After completing 10 questions, your score is calculated and displayed. At this time you are given the opportunity to continue or stop.

The states and capitals can be reversed by changing the following:

Line 80—SWAP STATES AND CAPITALS
Line 150—REPLACE CAPITAL AND A$(I) WITH STATE AND B$(I)
Line 160—REPLACE B$(I) WITH A$(I)
Line 380—REPLACE B$(I) WITH A$(I)

Here is a short description of some important lines:

Lines 30-60—Dimension Arrays, read the data into those arrays
Line 80—Instructions
Line 100—Sets # of questions to 10
Lines 110-130—Random number generates to select questions, checks that the same RND is not repeated successively
Line 150—Question format
Line 180—Sets counter for 2 tries to answer question
Lines 260-290—Scoring routine
Lines 320-360—Data for arrays

190	027F
320	054D
END	08CD

The listing:

```
10 'STATES AND CAPITALS
20 ' CHUCK FAESSLER FEB 1983
25 ' 617 CAMERON COURT
26 ' KENNER,LA. 70062
30 CLS:CLEAR 1000
40 DIM A$(50),B$(50)
50 FOR I=1 TO 50
60 READ A$(I),B$(I):NEXT I
```

JUST THE BEST

The RAINBOW

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P.O. Box 209
Prospect, KY 40059

```
70 PRINT@1,"**** STATES AND CAPI
TALS ****"
80 PRINT@68,"THIS PROGRAM WILL T
EST YOUR  KNOWLEDGE OF THE 50 ST
ATES AND CAPITALS. AFTER EACH ST
ATE (SELECTED AT RANDOM) TYPE IT
S CAPITAL FOLLOWED BY <ENTER>"
90 N=0:C=0:W=0:X=0
100 N=N+1:IF N>10 THEN 260
110 I=RND(50)
120 IF X=I THEN GOTO110
130 X=I
140 Q=0
150 PRINT"":PRINT"     WHAT IS T
HE CAPITAL OF      ";A$(I);:INPU
T Z$
160 IF Z$=B$(I) THEN 190
170 PRINT"":PRINT" NOT CORRECT!.
..TRY AGAIN":W=W+1
180 Q=Q+1:IF Q>=2 THEN 370 ELSE
150
190 R=RND(5):C=C+1:PRINT""
200 IF R=1 THEN 210:IF R=2 THEN
290:IF R=3 THEN 230:IF R=4 THEN
240:IF R=5 THEN 250
210 PRINT" CORRECT...YOU'RE A GE
NIUS!!":GOTO100
220 PRINT" CORRECT...YOU'RE EXCE
PTIONAL!!":GOTO100
230 PRINT" CORRECT...AMAZING ABI
LITY!!":GOTO100
240 PRINT" CORRECT...YOU'RE TOO
MUCH!!":GOTO100
250 PRINT" RIGHT ON...CARRY ON!!
":GOTO100
260 T=C+W
270 CLS:PRINT@6,"**** YOUR SCORE
 ****"
280 PRINT@64,C;"CORRECT";W;"WRON
G";" GRADE"INT(C/T*100);
290 PRINT"%"
300 PRINT@290,"DO YOU WISH TO CO
NTINUE":PRINT@ 325,"<ENTER> YES
OR NO":PRINT"":INPUT C$
310 CLS:IF C$="YES" THEN 90 ELSE
 410
320 DATA MASSACHUSETTS,BOSTON,MA
INE,AUGUSTA,VERMONT,MONTPELIER,N
EVADA,CARSON CITY,NEW HAMPSHIRE,
CONCORD,NEW YORK,ALBANY,NEW JERS
EY,TRENTON,CONNECTICUT,HARTFORD,
VIRGINIA,RICHMOND,WEST VIRGINIA,
CHARLESTON,MARYLAND,ANNAPOLIS,NO
RTH CAROLINA,RALEIGH
330 DATA SOUTH CAROLINA,COLUMBIA
,FLORIDA,TALLAHASSEE,GEORGIA,ATL
ANTA,ALABAMA,MONTGOMERY,ARKANSAS
,LITTLE ROCK,MISSISSIPPI,JACKSON
,WASHINGTON,OLYMPIA,NEW MEXICO,S
ANTA FE,NORTH DAKOTA,BISMARK,SOU
TH DAKOTA,PIERRE,IDAHO,BOISE,ILL
INOIS,SPRINGFIELD
340 DATA OHIO,COLUMBUS,INDIANA,I
NDIANAPOLIS,IOWA,DES MOINES,KANS
AS,TOPEKA,MISSOURI,JEFFERSON CIT
Y,OKLAHOMA,OKLAHOMA CITY,COLORAD
O,DENVER,UTAH,SALT LAKE CITY,HAW
AII,HONOLULU,ALASKA,JUNEAU,TEXAS
,AUSTIN,LOUISIANA,BATON ROUGE
350 DATA PENNSYLVANIA,HARRISBURG
,RHODE ISLAND,PROVIDENCE,WISCONS
IN,MADISON,MINNESOTA,ST PAUL,MIC
HIGAN,LANSING,KENTUCKY,FRANKFORT
,TENNESSEE,NASHVILLE,NEBRASKA,LI
NCOLN
360 DATA MONTANA,HELENA,WYOMING,
CHEYENNE,DELAWARE,DOVER,CALIFORN
IA,SACRAMENTO,OREGON,SALEM,ARIZO
NA,PHOENIX
370 PRINT"":PRINT"":PRINT" WELL,
I GUESS YOU REALLY DON'T       K
NOW IT!!(SHAME)"
380 PRINT"     THE CORRECT ANSWE
R IS          ";B$(I)
390 PRINT"":PRINT" NOW I WILL AS
K YOU AGAIN!"
400 GOTO140
410 END
```

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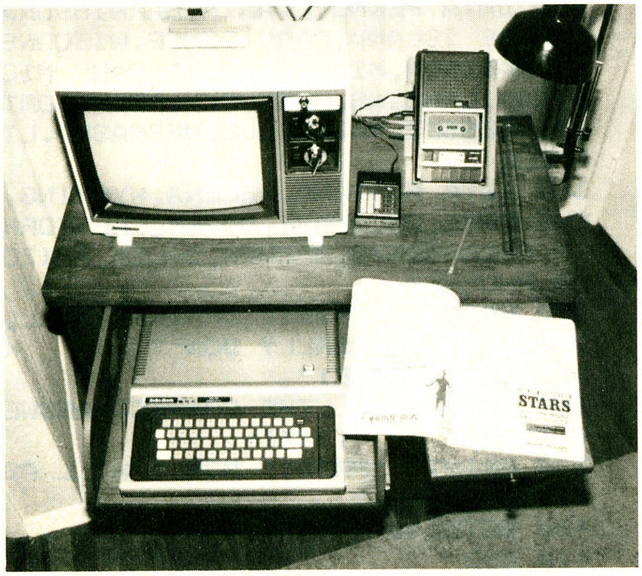


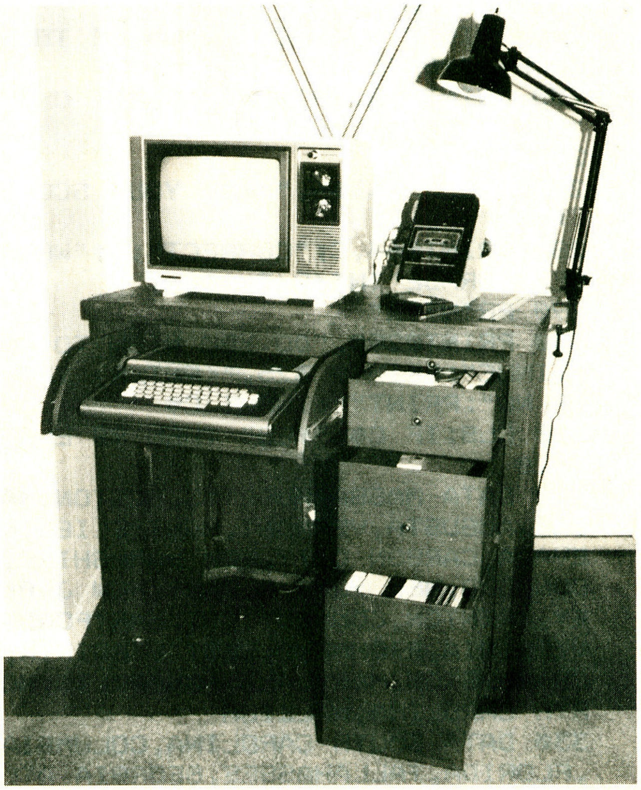
To the question of how to have organization hold sway over the chaos which can develop from the accumulated accoutrement of the avid computerist, one man's answer is to be found in a piece of custom-built furniture.

My prime concern was a place to keep everything together and yet have a compact piece of furniture when CoCo was not in use.

As you can see, it's built on the lines of a standard kneehole desk with a couple of important differences. The overall dimensions are 38″L, 20″W, and 33″H. The "drawer" that the computer sits on is 25″ from the floor (including casters), allowing plenty of space to sit comfortably. The drawer itself measures 16½″ deep by 18½″ wide which is wide enough to insert ROM Packs with no trouble. The additional height that this desk has keeps the monitor and CTR-80A at a very comfortable viewing angle. With the aid of the attached light, material on the top slide is easily read and the three drawers below are holding (so far) all the manuals, tapes, papers, and magazines that accumulate. The frame was made from oak (for extra weight and stability) and covered in half-inch thick plywood. The computer drawer is supported by a "full extension drawer slide" with a 50-pound load capacity when extended.

Cables from the computer go through a hole in the back of the drawer to a matching hole in the rear of the desk. A power outlet is located on the backside of the desk and is controlled by a single switch located inside the left front leg.

This is a fairly easy desk to make and the dimensions can be readily changed to suit your own needs.



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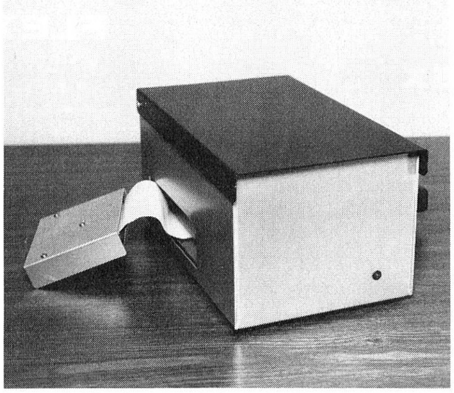
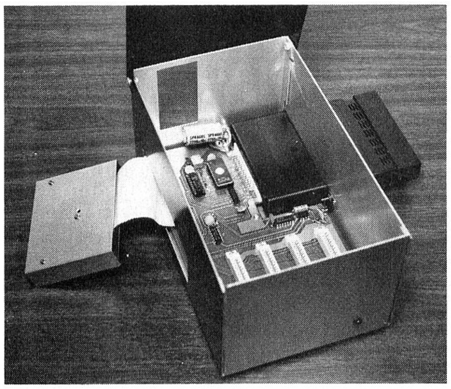
1. Here is Jeri plugging The Solution into the CoCo. Then she will move the main case up close to the CoCo. The cable is kept short to prevent noise and interference. The disk controller can be plugged into the side slot. The power supply plugs into a socket on the back of the case. All wires for the internal boards exit out the back of the case.

2. Here Jeri is setting the dip switches in The Solution. The hinged top makes the job easy. The switches can be set for three different things. Up to four boards can be installed inside the case.

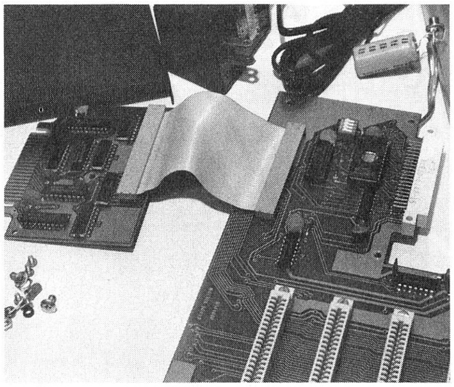
3. Here is The Solution at work. It makes a very nice addition to your CoCo with a black anodized top and a silver anodized main case both made from heavy aluminum stock.



4. Here's The Solution all by itself. The heavy aluminum anodized case is a thing to be proud of. The buffer board can be seen to the left of the main case. The LED indicator on the front comes on when you turn on the power to your CoCo. The Solution needs no on/off switch.



5. All that's missing from this picture is the plug in the wall power supply. You can see the 4K EPROM monitor and the 4 position dip switch. At the front are four of the five expansion slots with a disk controller plugged into the fifth slot on the side. The power LED is at the lower right front of the case.



6. Here's the real guts to The Solution. We took it all apart so that you could look at the parts. The 1 amp power supply can be seen in this picture. All the connectors are gold as you would expect. The small board is the buffer board. The white connectors are the same as the CoCo's.

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THE SOLUTION AND WHY WE BUILT IT

When we first introduced FLEX for the CoCo in February 1982 we received hundreds of calls from software and hardware developers who wanted to use the CoCo because it was so inexpensive compared to everything else on the market. However there is not enough expansion or I/O in the CoCo to make this possible for most of these users. I know that the CoCo is viable in most cases, but for many, there needed to be more. So that was the original reason for designing the expansion box we call "THE SOLUTION."

The motherboard has the 2K/4K EPROM socket with a 4K monitor EPROM in it. Also inside are 4 vertical connectors for internally mounted boards or ROM type cartridges. The fifth connector is horizontal and is made for the disk controller, ROM cartridges or additional expansion out the side the of The Solution. A four position dip switch allows for 3 options to be selected. One option will cause the CoCo to get its interrupt and reset vectors from the monitor instead of RS Basic.

If you choose to come up in the monitor, then it is not necessary to have RS Extended Basic in the CoCo to boot FLEX because the monitor has a built-in boot. This saves $100.00 of the cost of The Solution. The power supply is a plug-in-the-wall type with a connector in the back of the case. The back of the case is open and it is thru this that all the cables for the different cards go. This makes for a very neat appearance.

TECHNICAL SPECIFICATIONS

*Bus Structure...*Fully buffered Color Computer compatible bus. Priority daisy chained arrangement where each slot has a priority assigned to it. The farther out on the bus that you are, the less priority you have. The disk slot (0) has the highest priority with slot 1, 2, 3, and then 4 has the lowest. The pinout and the timing is the same as the Color Computers with the exception of the sound line. This is used on the motherboard for the priority line.

*Power Supply...*The power supply is a tracking power supply which means that the Color Computer itself turns The Solution on and off so that there is no need for an on/off switch. A LED on the front of The Solution indicates when the entire system is on or off. The tracking power supply means that The Solution's bus voltage will be the same as the Color Computers to within a very few minnivolts. The power supply included with The Solution is a 1 amp supply for the 5 volt line only. The +12 and −12 voltages are taken from the Color Computer.

Dip switch options...

1) Select the 4K ROM monitor. When this option is selected, the system will come up in the monitor and get interrupt vectors from it rather than the Radio Shack Basic ROM. The reason you might want to do this is so you can boot FLEX from the monitor rather than Basic. This will allow running FLEX without have to have Extended Color Basic in the CoCo. This also ties in with the option on the serial card to come up on a terminal instead of the CoCo TV set and keyboard.

2) Disable the disk slot (0). This will allow using ROM cartidges in The Solution without unplugging the disk card. When the switch is on, the ROM is active. When it is off, whatever ROM cartridge is there is active. This infers that you could switch back and forth between a cartridge and the disk system. This is NOT necessarily true because of the need to initialize the disk software in the ROM and this may destroy what is in memory. It may be possible under special circumstances to do this but it is up to the user to work it out.

3) Select either a 2K or a 4K EPROM. This is set for a 4K EPROM which is included with The Solution. However, it can be changed if you have a need. The EPROM is addressed at $E000.

4) User definable. This means that we didn't use this switch for anything, but you can if you want, or we could call it 'reserved for future expansion.' This means that we don't have any use for it now, but we may in the future.

The Solution I/O cards are addressed at either the $FF60-$FFBF area OR the $FE00-$FEFF area.

These prices and specs are subject to change without notice. Call for confirmation.

THE SOLUTION (Price includes case and power supply.)	**$249.00**

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Note: We are considering several other cards for The Solution. Please let us know what you want, if there is enough interest, we will make it.

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Software Review . . .

So So, Señor

Buenos dias. Me llamo Barbara. Donde esta un programme satisfactorio?

That is what I was asking when I concluded working through *Spanish One,* a beginner's program for "learning elements of the Spanish language," created by the West Bay Company of White Stone, Virginia.

Its introduction says that by using this program, one can "quickly ... learn to read and speak Spanish," and that it is for "beginners or those persons needing to refresh their memory." The program offers "100 useful words and 100 useful phrases."

A person using *Spanish One* should not expect to "learn" the Spanish language. He/she will learn some vocabulary and even some pronunciation. A fairly creative attempt to imitate through phonetic representation the sound of the language has been made. However, one must learn elsewhere the sophisticated sounds or vocabulary intricacies of the Spanish language.

Moreover, the vocabulary words chosen for study include words seldom used in ordinary conversation, such as "ceiling," "handkerchief," "stocking," "jacket," and "box."

Teachers hoping to use this program to supplement classwork will be dismayed at the number of its inadequacies. First of all, the basic idea of gender (masculine and feminine endings) is poorly handled. Occasional lack of information in the questions penalizes the student who answers "estrecho" for "narrow" if the feminine "estrecha" was the programmed response. If a score were kept, the ultimate score could be devastating.

Sound cues are offered to identify right and wrong answers, but perhaps the creator should have used Spanish terminology to applaud or admonish responses, rather than English.

Another basic part of "mastering" Espanol is keeping track of articles which precede nouns. Gender does sometimes make a difference for understanding. The handling of this, too, is inconsistent.

Could West Bay have come up with a way to provide synonyms alongside the preferred response so that the student would not become so discouraged or even angry? If the response one types in is close, somehow he/she should be rewarded for that. If *"Spanish One"* is for beginners, okay, they won't know any better, maybe. But students "refreshing their memory of the language" will be quickly alienated.

In addition, the programmer has been careless in the presentation of verbs. Inconsistencies frustrate the student. One time the subject pronoun is required; at other times, just the verb is acceptable. And one also "misses" if his/her English verb for "toma," for example, is "is taking" instead of "takes." Both are actually acceptable and, out of context, the student doesn't know which to give.

Other knowledge of Spanish verbs is required (but not taught here), for example with regard to the verb "to be." How does the user of this program learn the difference between "es" and "esta" for "it is"? Or the subtleties of choosing between familiar or formal verbs?

Another annoyance is the inconsistency in punctuation. Occasionally abbreviations or statements will be punctuated, but often they are not. And the student must hope her/his response is "lucky" enough to be punctuated just so, or—Bingo—another "wrong" answer.

(The program's notes contain a disclaimer that standard diacritical marks, such as inverted punctuation marks or the tilde, cannot be shown on their computer. Some compensation is made for this in the phonetic spelling.)

As an English teacher with a minor in Spanish, I strongly object to errors in plain, old grammar. The creator's statement "That is between you and me" translates "El esta entre usted y yo." "Yo" is the pronoun for "I," an error which only serves to perpetuate a common error in our own sloppy use of English.

There are other ambiguities in the program, but one glaring error is inconsistency in spelling of vocabulary words. Early on I learned that "corbata" means "tie" only to be marked wrong later when the required response was "cobata." This carelessness is inexcusable.

The program has its merits. For starters, one can choose between English words to be translated into Spanish words or vice versa. Likewise, one can practice translating phrases from one language to the other. Repetition is a second plus as one is randomly called upon to repeat responses so eventually they are learned. Also, the program notes describe a method of extending the time a word is on the screen so one can "study" it. Finally, the phonetic representation is helpful in learning pronunciation.

West Bay concludes the notes by touting this is a "good program. Enjoy!" The program is fairly entertaining and the price is very reasonable, but the Spanish wouldn't get you very far in South America. (Translation of opening paragraph: "Hello. My name is Barbara. Where is a satisfactory program?) Hasta luego!

(West Bay Company, Route 1, Box 666, White Stone, VA 22578, $8 on tape)

—Barbara Combes

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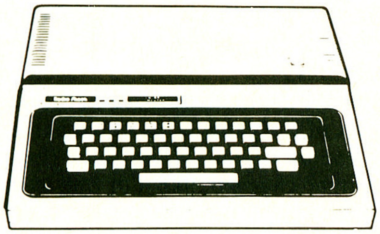

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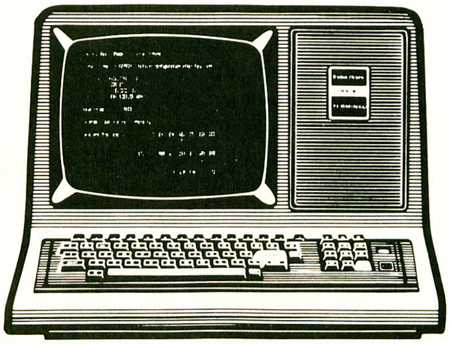

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Software Review . . .

Kamikaze Is Good Arcade/Adventure Hybrid

Most computer games, in my experience, seem to fall into two categories. There are the arcade games, which are basically tests of hand-eye coordination and quick reflexes, and there are adventure games, which require a bit of thinking, but frequently become overly long and frustrating to play.

So it's refreshing to run into that rare game that doesn't fit into either mold. Such a game is *Kamikaze.*

Like an adventure, *Kamikaze* requires a bit of strategy, and a good measure of luck. Like an arcade game, Kamikaze makes good use of CoCo's graphics capabilities to illustrate the playing field and the battles.

As the documentation states—and one should always begin by reading the documentation, of course—"*Kamikaze* is a naval battle game depicting a Midway-type encounter between American and Japanese forces at the close of WWII. Player controls the American force of 12 ships and 78 planes and must destroy the Japanese fleet before it and more than 25 kamikaze squadrons find and destroy him."

The 12 ships are divided among aircraft carriers, battleships, heavy and light cruisers, and destroyers. They vary in their ability to attack and to withstand enemy fire.

There are several different screens that appear during the course of the game. The text screens—"Bridge," "Flag," "Target," and "Intelligence"—provide the data you will need during the strategy and the combat. The Map screen graphically shows your location, and the location of enemy planes and ships that you will be able to spot using radar, search planes, and picket boats.

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When you spot the enemy—or when the Japanese fleet sneaks up on you—there are several kinds of battles which may result.

The most graphic battle is a kamikaze attack, which you may choose to fight with a joystick or refuse the joystick (in which case your ship will fire at random on the invading Japanese dive bombers.)

After playing one game without the joystick—which had the effect of making me a spectator at the battle rather than a participant—I found I preferred to do my own shooting. It may look easy—but you'll be surprised! As author Phil Keller explains in the instruction sheet, he has programmed in a "random miss factor." (By the way, the documentation contains several such insights into the programming of the game. More on that in a moment.)

Another battle is planes against planes. This one isn't quite so graphic—just a line-up of yours on one side and theirs on the other. Shots are fired at random.

If your aircraft are ready—and about half the time they won't be—when the enemy fleet is in range, then you can attack their ships with dive bombers and torpedo bombers. You'll have to place the planes over the battle area in the best strategic locations.

Unfortunately, the most decisive battle is not graphic at all. The object of the game is, as noted earlier, the destruction of the enemy's fleet. When their fleet invades your space, you will be engaged, like it or not, in a surface battle. What you see looks something like a news wire: "Carrier Seminole hit—sinking ... enemy ship hit ... miss ... miss...," etc. Your only choice is to stay and fight or try an escape, which may or may not be successful.

Time of the game is divided into eight "days" with four turns per day. At the end of that time, you will have one of five ratings which range from "disastrous defeat" to "decisive victory."

With regard to the documentation, on the whole it seems well-written, but the game is not easy to master. (That's all to the good—you won't get bored with it right away.) There are a large number of commands and screens and situations to learn, and it will take at least three games to really get into it.

In addition to six pages of instructions, Mr. Keller has included two pages of programming notes. He offers a couple of tips on strategy, tells where to put in a speed poke if you want one, and even goes into detail as to how he made use of the *GET* and *PUT* commands to animate the destruction of the kamikazes.

The game requires 32K and Extended Basic.

(Ark Royal Games, P.O. Box 14806, Jacksonville, FL 32238, $24.95)

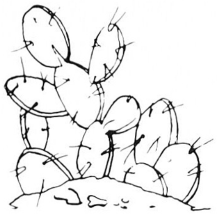
—Neil Edward Parks

Hint . . .

Speed Up Your CoCo

You can double the speed at which CoCo operates with a simple POKE statement, entered either directly from the keyboard or within a program. The statement is POKE 65495,0. This will speed up your CPU. You can return the computer to normal speed again by POKE 65494,0.

Note that you cannot perform any Input/Output operations, such as saving the program to cassette, when the speedup is in effect. You may also lose temporary keyboard control. If this happens, a simple press of the RESET button will bring things back to normal, too.



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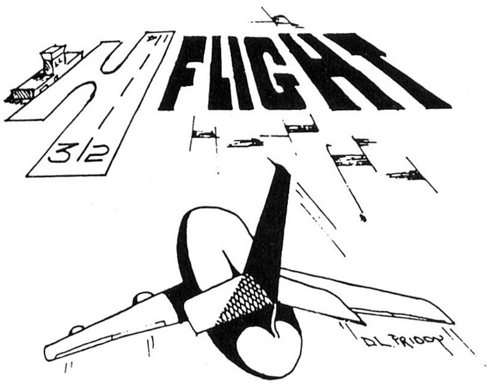

Flight

If you'd like to fly a plane then this is what you've been waiting for. A really good graphics oriented flight simulator in high resolution. Four difficulty levels let you go from student level to a difficult instrument-only landing. In front of you on the screen are your instruments, and above them are two representations of your plane in relation to the flight path (top and side views). At the higher levels all you have to go by are the instruments. Can you put it down on the runway to hear the synthesized voice from the tower say "perfect landing"? It's tough! You use your joystick just like the control stick on a plane, and the action is realistic indeed. This program was written by a professional flyer — a pilot for a major United States air carrier, and the high standards of professionalism really show. Just CLOADM and take to the skies!! Requires 32K extended. **TAPE** is **$19.95 — DISK** is **$24.95**

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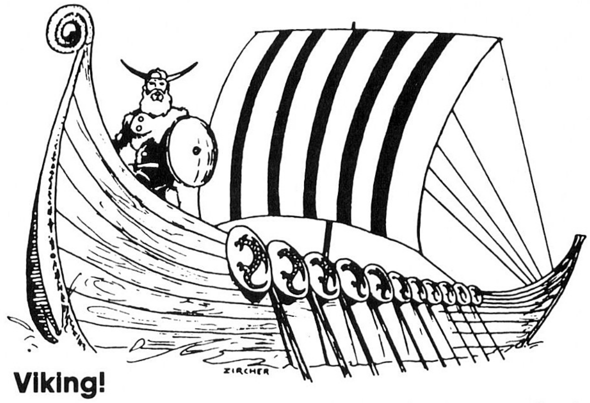
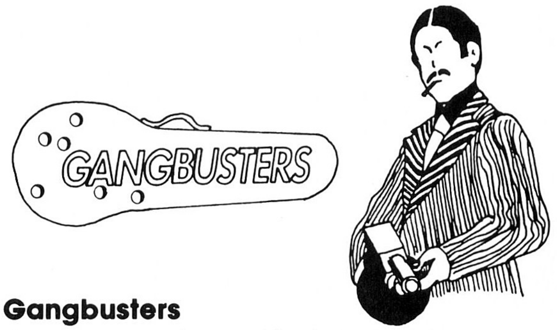
If you are running a disk system, we suggest that you order the disk version, because the cassette version will not run on a disk system without modification or disconnection of the disk controller. The above disk programs require 32K Ram.

Your Personal check is welcome - no delay. Include $1.50 shipping for each program ordered. (Shipping free on $50.00 or larger orders). Az. residents add 6% sales tax. Orders shipped within two days.



Viking!

A simulation for 1 to 4 persons. Each begins as a landowner, and by farming their land, buying and selling land, expanding their fishing fleet, building on to their manufactory, increasing their population, equiping and training more soldiers, and regulating their taxes, each player tries to increase their economic power and rank until one becomes ruler over all. But beware plagues, rats, raiders, revolts, bad weather, and other misfortunes which may lie along the road to success. As you progress, see the map of your holdings increase. Playable in 1 to 2 hours, and different every time, you may have an addiction problem. **$19.95 tape — $24.95 disk**



Gangbusters

If you ever wanted to try a life of crime, this is your chance. You will start out as a Punk, but by using brains, and a little muscle, you can rise to become a Hood, Runner, Bookie, Torpedo, Fence, Kingpin, or win by becoming Syndicate Boss. Indulge yourself. Bribe a judge, or the District Attorney. Pay off the Cops. Take out a contract on another player, but watch out, they may be after you. Buy trucking companies, bootleg operations, houses of ill fame, but remember, if you get caught, you may do some hard time. Do you have what it takes to take over? This game will keep you close to your rod, get you thinking about bulletproof glass in your car, and definitely bring out the worst in you, but you'll love every minute of it. For 2 to 6 players, takes about 2 hours to play. Every game is excitingly different. **$19.95 tape — $24.95 disk**

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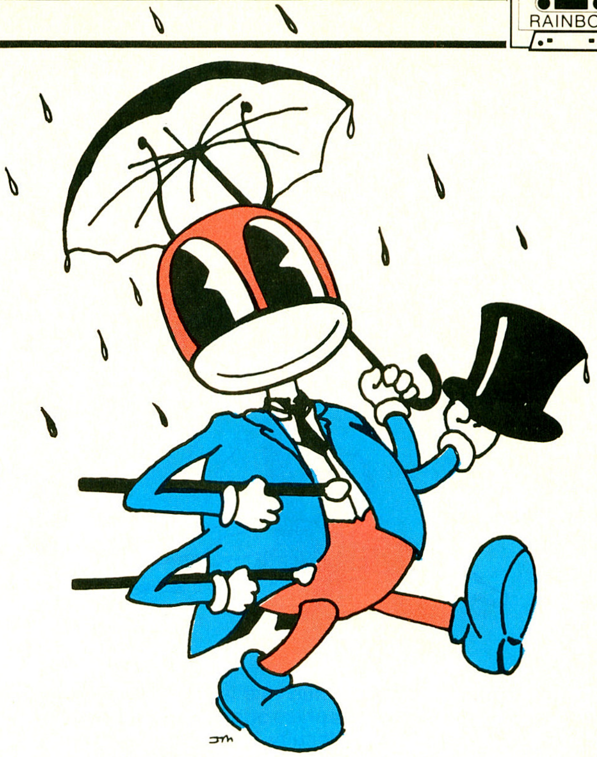
The Multi-Talented, Dancing *RAINBUG*

By
Dan Downard



(This month's article by Dan Downard is the first of a four-part series on our new machine language monitor being developed by the author.)

What is a monitor? How does an assembler work? What do they do? These are probably the most confusing issues that face the beginning computer owner. Everyone talks about machine language programs, but what are the advantages, and disadvantages, of assembly language programs? Hopefully, in the next few issues, we will clarify these questions and give you the necessary tools to write your own programs. Where should we start? First, let us define some terms.

Machine Language

The 6809 microprocessor inside the CoCo follows a logical sequence of operations as it steps through memory. Program information in memory tells the processor what step to take next. This information in memory is coded in sequential order and the processor reads these instructions and performs the operation requested. Normally, we like to refer to the bytes of instructions as operational codes, or op-codes. By learning what op-codes are available and how to use them we can make the processor input and output data display information on the screen or interface with various peripheral devices. Machine language is the only language the computer can understand. The Extended Color BASIC ROM in your computer is actually a machine language program that converts BASIC keywords and statements in memory to machine codes. This type of program is called an Interpreter. Programs that can directly input machine code into memory are called *monitor* or *debug* programs. These programs are very important tools for the machine language programmer.

Assembly Language

Motorola developed a set of mnemonic symbols to represent all of the microprocessor instructions. Instead of remembering 256 possible numbers representing instructions, each set of operations is given a mnemonic code and a structured set of symbols to represent the addressing mode. These codes are written as a text file representing the sequential operation of the processor. A program called an *assembler* is used to translate this file into machine code.

Why are most of these programs called *editor-assemblers*? The *editor* gives you the proper software to write your text file and is thereby a natural companion to the *assembler*. Programs are also available to convert machine language to assembly language. These programs are normally referred to as a *dissasembler*.

Assembler vs. Machine Code

Essentially, there is no difference between machine language and assembly language. Both are designed to serve the same end purpose. In terms of operating programs, a monitor would be used to modify or "Debug" an existing program. An assembler would be used to develop new programs.

The easiest way to understand machine language programming is to try to modify a program to suit your own needs. After all, you can look through the ads in this issue and likely find something similar to what you want to accomplish. What about the programs with listings in the magazine? How do you input a machine language program into memory? I find it very tedious to convert all of the hexadecimal instructions into decimal poke statements. With a monitor, all you have to do is input the hex numbers exactly as they appear.

At the same time, why use machine language at all? What's wrong with Extended Color BASIC? Well, I guess there is no standard answer to that question other than another question. Will BASIC do everything you want it to do?

To paraphrase *Getting Started With Color BASIC*, machine language programs are very fast and require less memory than a BASIC program. To give you an example, did you know that your TRS-80C executes instructions at the rate of approximately 200,000 per second? Why not take advantage of it?

Monitors

There are several excellent machine language monitor programs on the market. *Table 1* is a comparison of several of the more popular offerings. To me, the prerequisites of a monitor are memory examine/change, tape loading and saving of programs, register examine/change and breakpoints. What is a breakpoint? A breakpoint is a method of interrupting a program during operation to examine registers, memory, etc. to ensure that the program is operating properly.

Monitor Program Comparison Chart

	Zbug *Radio Shack*	**Cbug** *Microworks*	**Colormon** *Tom Mix*	**Sigmon** *Datasoft*	**Humbug** *Star-Kits*
Size	Rom Pak	1.5K	1K	6K	4K
Relocatable	No	Yes	Yes	Yes	Yes
Examine/Change Memory					
Hex	Yes	Yes	Yes	Yes	Yes
ASCII	Yes	Yes	Yes	Yes	Yes
Octal	Yes	No	No	Yes	No
Graphics	No	Yes	No	Yes	No
Execute Program	Yes	Yes	Yes	Yes	Yes
Tape					
Load	Yes	No	No	Yes	No
Save	Yes	Yes	No	Yes	Yes
Verify	Yes	No	No	No	No
Mikbug Load/Save	No	Yes	No	Yes	Yes
Breakpoint					
Set/Reset	Yes	No	Yes	Yes	Yes
Display	Yes	No	No	Yes	Yes
Continue After BPoint	Yes	Yes	No	Yes	Yes
Single Step	Yes	No	No	Yes	Yes
Return To Basic	Yes	Yes	Yes	Yes	Yes
Print/Change Registers	Yes	Yes	Yes	Yes	Yes
Disassemble	Yes	No	No	Yes	Yes
Assemble	Yes	No	No	Yes	No
Search Memory	No	No	No	Yes	Yes
Tape Analyzer	No	No	No	No	Yes
Change Baud Rate	No	Yes	No	No	Yes
Non-Standard Printer	No	No	No	No	Yes
Printer On/Off	Yes	No	No	Yes	Yes
Pause Listing	No	No	No	Yes	Yes
Dumb Terminal	No	Yes	No	No	Yes
Remote Terminal	No	Yes	No	No	Yes
Change Screen Page	No	Yes	No	No	No
Help Command	No	No	No	No	Yes
Move Memory	Yes	Yes	No	Yes	Yes
Move Monitor	No	No	No	No	Yes
Checksum	No	No	No	No	Yes
Memory Test	No	No	No	No	Yes
Memory Compare	No	No	No	No	Yes
Fill Memory	No	Yes	No	No	Yes
Hex/Dec Convert	Yes	Yes	No	Yes	No
Calculate Mode	Yes	No	No	No	No

At the same time, breakpoints are used to isolate certain parts of the program for troubleshooting purposes.

Getting back to the table, one of the terms that may look unfamiliar is MIKBUG under tape features. MIKBUG was the original monitor for the 6800 computer written by Motorola. Tapes in a MIKBUG format were the standard for many early 6800 computers. This command gives you the facility of loading programs from tapes made by the SWTP, EXORCISER, etc. computers. There is a wealth of software already written, but undiscovered for the TRS-80C. I would recommend any of these programs depending on which features you desire. Consult the ads in the magazine for sources of supply. All of these monitors perform the basic functions as defined above. The only real difference is in the auxiliary functions.

RAINBUG

In an effort to give you an insight into machine language programming, we are going to present a complete machine language monitor in the next four issues of *Rainbow*. It will affectionately be called *RAINBUG*. The Motorola ASSIST-09 monitor was used as a guideline as it was readily available and has features not contained in other monitors on the market. Features of *RAINBUG* are as follows:

- —Memory Examine/Change
- —Register Examine/Change
- —Postbyte Calculation
- —Breakpoints
- —Offset Calculation
- —Single Step
- —Save to Tape
- —Load Tape
- —Verify Tape
- —Expression Calculation
- —Disk Memory Examine/Change

At the same time we hope to explain how to write your own programs or modify existing programs to suit your own needs. Since space is limited, reference material will be necessary. The MC6809-MC6809E Microprocessor Programming Manual is available from:

Motorola Semiconductor Products, In.
Literature Distribution Center
P.O. Box 20924
Phoenix, AZ 85036

A request for technical information in the form of a letter will be sufficient. Motorola will then send you a catalog of technical information available and an order form.

Memory Examine/Change

Listing 1 contains the assembly source code for the memory examine and change routine of *RAINBUG*. The formats are as follows:

M (Address) / Initiate memory/change at (Address). Address may be an expression.
(Address) / Initiate memory change at (Address). Address may not be an expression.
/ Memory/change at address of last memory/change.

After the present byte is displayed, the following commands can be entered:

(Byte) Replace present byte with new value. This value may be an expression.
(Space) Print value at next address.
(,) Go to next address without printing value.
(↓) Print next address and byte value
(↑) Print previous address and byte value.
(Enter) Terminate command.
(')TEXT(') Enter ASCII text.

If the memory is not changed, a question mark will appear and the next memory will be displayed. All addresses and memory values are displayed in hexadecimal notation.

Expressions

Address and byte values may be in the form of an expression. Each expression consists of one or more values separated by a "+" or "—" operator, meaning addition or subtraction. For example entering (4000+2000) would give you an address of $6000. This function is very useful when writing position independent code, etc.

Summary

Next month, we will begin learning the terminology of mnemonics and their corresponding op-codes.

Hopefully, there will be enough information for both the beginner and experienced programmer to make it interesting. At the same time, we will present the initialization routines and command table for *RAINBUG*. I hope we are not getting ahead of ourselves by including this listing, but before you can input any machine code into the computer you have to have a monitor. The part of *RAINBUG* presented this month will run if you have the facility of inputting it into your computer. Once the machine codes are in memory perform a *CSAVEM "RAINBUG1"*,&H3000, &H319D,&H3000. (An easier way would be to wait for your *Rainbow on Tape*.) After loading, type *EXEC* and the first address you wish to examine. If you accidentally exit the program, an *EXEC* will get you back.

The listing:

```
                   00100 *RAINBUG-PART 1
                   00110 *DAN DOWNARD
3000               00120         ORG     $3000
           3006    00130 CMDBAD  EQU     CMEM2
           008C    00140 SKIP2   EQU     $8C
           A000    00150 POLCAT  EQU     $A000
           A002    00160 CHROUT  EQU     $A002
                   00165 *MEMORY EXAMINE/CHANGE
3000 17    013C    00170 CMEM    LBSR    CDNUM
3003 FD    3197    00180 CMEMN   STD     ADDR
3006 BE    3197    00190 CMEM2   LDX     ADDR
3009 17    0145    00200         LBSR    OUT2H
300C 86    2D      00210         LDA     #$2D
300E 17    0169    00220         LBSR    OUTCH
3011 17    007F    00230 CMEM4   LBSR    BLDNNB
```

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```
3014 27   0B     00240          BEQ    CMENUM
                 00245 *COMMA-SKIP BYTE
3016 81   2C     00250          CMPA   #$2C
3018 26   10     00260          BNE    CMNOTC
301A BF   3197   00270          STX    ADDR
301D 30   01     00280          LEAX   1,X
301F 20   F0     00290          BRA    CMEM4
3021 F6   319A   00300 CMENUM   LDB    NUMBER+1
3024 8D   50     00310          BSR    MUPDAT
3026 81   2C     00320          CMPA   #$2C
3028 27   E7     00330          BEQ    CMEM4
                 00335 *ASCII STRING
302A 81   27     00340 CMNOTC   CMPA   #$27
302C 26   0D     00350          BNE    CMNOTQ
302E 17   0107   00360 CMESTR   LBSR   READ
3031 81   27     00370          CMPA   #$27
3033 27   0D     00380          BEQ    CMSPCE
3035 1F   89     00390          TFR    A,B
3037 8D   3D     00400          BSR    MUPDAT
3039 20   F3     00410          BRA    CMESTR
                 00415 *SPACE-NEXT BYTE
303B 81   20     00420 CMNOTQ   CMPA   #$20
303D 26   08     00430          BNE    CMNOTB
303F BF   3197   00440          STX    ADDR
3042 17   0125   00450 CMSPCE   LBSR   SPACE
3045 20   BF     00460          BRA    CMEM2
                 00465 *DOWN ARROW-NEXT BYTE
                 00466 *WITH ADDRESS
3047 81   0A     00470 CMNOTB   CMPA   #$0A
```

```
3049 26   0A     00480          BNE    CMNOTL
304B 86   0D     00490          LDA    #$0D
304D 17   012A   00500          LBSR   OUTCH
3050 BF   3197   00510          STX    ADDR
3053 20   0C     00520          BRA    CMPADP
                 00525 *UP ARROW-PREVIOUS BYTE
                 00526 *WITH ADDRESS
3055 81   5E     00530 CMNOTL   CMPA   #$5E
3057 26   0C     00540          BNE    CMNOTU
3059 30   1E     00550          LEAX   -2,X
305B BF   3197   00560          STX    ADDR
305E 17   0122   00570 CMPADS   LBSR   PCRLF
3061 8D   07     00580 CMPADP   BSR    PRTADR
3063 20   A1     00590          BRA    CMEM2
                 00595 *SLASH-NEXT BYTE
                 00596 *WITH ADDRESS
3065 81   2F     00600 CMNOTU   CMPA   #$2F
3067 27   F5     00610          BEQ    CMPADS
3069 39          00620          RTS
                 00625 *PRINT ADDRESS
306A BE   3197   00630 PRTADR   LDX    ADDR
306D 34   10     00640          PSHS   X
306F 30   E4     00650          LEAX   ,S
3071 17   00F2   00660          LBSR   OUT4HS
3074 35   90     00670          PULS   PC,X
                 00675 *UPDATE BYTE
3076 BE   3197   00680 MUPDAT   LDX    ADDR
3079 E7   80     00690          STB    ,X+
307B E1   1F     00700          CMPB   -1,X
```

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```
307D 26    04     00710          BNE    MUPBAD
307F BF    3197   00720          STX    ADDR
3082 39           00730          RTS
                  00735 *UPDATE BAD
3083 34    02     00740 MUPBAD   PSHS   A
3085 86    3F     00750          LDA    #$3F
3087 17    00F0   00760          LBSR   OUTCH
308A 35    82     00770          PULS   PC,A
                  00775 *SET WINDOW VALUE
308C 17    00B0   00780 CWINDO   LBSR   CDNUM
308F FD    319C   00790          STD    WINDOW
3092 39           00800          RTS
                  00805 *EXPRESSION ANALYZER
                  00806 *NO LEADING BLANKS
3093 4F           00810 BLDNNB   CLRA
3094       8C     00820          FCB    SKIP2
                  00825 *ACCEPT LEADING BLANKS
3095 86    20     00830 BLDNUM   LDA    #$20
3097 B7    319B   00840          STA    DELIM
309A 34    14     00850 EXP1     PSHS   X,B
309C 8D    66     00860 EXPDLM   BSR    BLDHXI
309E 27    1C     00870          BEQ    EXP2
                  00875 *SKIP BLANKS
30A0 B1    319B   00880          CMPA   DELIM
30A3 27    F7     00890          BEQ    EXPDLM
                  00895 *TEST FOR M,P OR W
30A5 BE    3197   00900          LDX    ADDR
30A8 81    4D     00910          CMPA   #$4D
30AA 27    18     00920          BEQ    EXPTDL
30AC BE    3195   00930          LDX    PCNTER
30AF 81    50     00940          CMPA   #$50
30B1 27    11     00950          BEQ    EXPTDL
30B3 BE    319C   00960          LDX    WINDOW
30B6 81    57     00970          CMPA   #$57
30B8 27    0A     00980          BEQ    EXPTDL
30BA 35    94     00990 EXPRTN   PULS   PC,X,B
                  00995 *GET HEX NUMBER
30BC 8D    4C     01000 EXP2     BSR    BLDHEX
30BE 27    FC     01010          BEQ    EXP2
30C0 20    0C     01020          BRA    EXPCDL
                  01025 *STORE AND CHECK DELIMITER
30C2 AE    84     01030 EXPTDI   LDX    ,X
30C4 BF    3199   01040 EXPTDL   STX    NUMBER
30C7 7D    319B   01050          TST    DELIM
30CA 27    EE     01060          BEQ    EXPRTN
30CC 8D    6A     01070          BSR    READ
                  01075 *TEST FOR + OR -
30CE BE    3199   01080 EXPCDL   LDX    NUMBER
30D1 81    2B     01090          CMPA   #$2B
30D3 26    10     01100          BNE    EXPCHM
30D5 8D    26     01110          BSR    EXPTRM
30D7 34    02     01120          PSHS   A
30D9 FC    3199   01130          LDD    NUMBER
30DC 30    8B     01140 EXPADD   LEAX   D,X
30DE BF    3199   01150          STX    NUMBER
30E1 35    02     01160          PULS   A
30E3 20    E9     01170          BRA    EXPCDL
30E5 81    2D     01180 EXPCHM   CMPA   #$2D
30E7 27    07     01190          BEQ    EXPSUB
30E9 81    40     01200          CMPA   #$40
```

```
30EB 27    D5     01210          BEQ    EXPTDI
30ED 5F           01220          CLRB
30EE 20    CA     01230          BRA    EXPRTN
30F0 8D    0B     01240 EXPSUB   BSR    EXPTRM
30F2 34    02     01250          PSHS   A
30F4 FC    3199   01260          LDD    NUMBER
30F7 40           01270          NEGA
30F8 50           01280          NEGB
30F9 82    00     01290          SBCA   #0
30FB 20    DF     01300          BRA    EXPADD
                  01305 *NEXT EXPRESSION
30FD 8D    96     01310 EXPTRM   BSR    BLDNUM
30FF 27    36     01320          BEQ    CNVRTS
3101 16    FF02   01330 BLDBAD   LBRA   CMDBAD
                  01335 *BUILD HEX BYTE
3104 7F    3199   01340 BLDHXI   CLR    NUMBER
3107 7F    319A   01350          CLR    NUMBER+1
310A 8D    2C     01360 BLDHEX   BSR    READ
310C 8D    13     01370 BLDHXC   BSR    CNVHEX
310E 26    27     01380          BNE    CNVRTS
3110 C6    10     01390          LDB    #16
3112 3D           01400          MUL
3113 86    04     01410          LDA    #4
3115 58           01420 BLDSHF   ASLB
3116 79    319A   01430          ROL    NUMBER+1
3119 79    3199   01440          ROL    NUMBER
311C 4A           01450          DECA
311D 26    F6     01460          BNE    BLDSHF
311F 20    14     01470          BRA    CNVOK
                  01475 *ASCII TO BINARY
3121 81    30     01480 CNVHEX   CMPA   #$30
3123 25    12     01490          BLO    CNVRTS
3125 81    39     01500          CMPA   #$39
3127 2F    0A     01510          BLE    CNVGOT
3129 81    41     01520          CMPA   #$41
312B 25    0A     01530          BLO    CNVRTS
312D 81    46     01540          CMPA   #$46
312F 22    06     01550          BHI    CNVRTS
3131 80    07     01560          SUBA   #7
3133 84    0F     01570 CNVGOT   ANDA   #$0F
3135 1A    04     01580 CNVOK    ORCC   #4
3137 39           01590 CNVRTS   RTS
                  01595 *INPUT CHARACTER
3138 8D    34     01600 READ     BSR    INCH
313A 81    03     01610          CMPA   #$03
313C 27    C3     01620          BEQ    BLDBAD
313E 39           01630          RTS
                  01635 *OBTAIN NUMBER
313F 17    FF53   01640 CDNUM    LBSR   BLDNUM
3142 26    0A     01650          BNE    CDBADN
3144 81    2F     01660          CMPA   #$2F
3146 22    06     01670          BHI    CDBADN
3148 81    0E     01680          CMPA   #$0E
314A FC    3199   01690          LDD    NUMBER
314D 39           01700          RTS
314E 16    FEB5   01710 CDBADN   LBRA   CMDBAD
                  01715 *OUTPUT BYTE IN HEX
3151 A6    80     01720 OUT2H    LDA    ,X+
3153 34    06     01730          PSHS   D
3155 C6    10     01740          LDB    #16
```

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```
3157 3D          01750          MUL
3158 8D    04    01760          BSR     OUTHX
315A 35    06    01770          PULS    D
315C 84    0F    01780          ANDA    #$0F
315E 8B    90    01790 OUTHX    ADDA    #$90
3160 19          01800          DAA
3161 89    40    01810          ADCA    #$40
3163 19          01820          DAA
3164 20    14    01830 SEND     BRA     OUTCH
                 01835 *OUTPUT ADDRESS
3166 8D    E9    01840 OUT4HS   BSR     OUT2H
                 01845 *OUTPUT BYTE
3168 8D    E7    01850 OUT2HS   BSR     OUT2H
                 01855 *OUTPUT SPACE
316A 86    20    01860 SPACE    LDA     #$20
316C 20    0C    01870          BRA     OUTCH
                 01875 *KEYBOARD INPUT
316E 34    15    01880 INCH     PSHS    X,B,CC
3170 AD    9F A000 01890 INCH1  JSR     [POLCAT]
3174 27    FA    01900          BEQ     INCH1
3176 8D    02    01910          BSR     OUTCH
3178 35    95    01920          PULS    X,B,CC,PC
                 01925 *OUTPUT TO SCREEN
317A 34    12    01930 OUTCH    PSHS    A,X
317C AD    9F A002 01940        JSR     [CHROUT]
3180 35    92    01950          PULS    A,X,PC
                 01955 *SEND CR/LF
3182       04    01960 PCRLS    FCB     $04
                 01965 *CR/LF AND STRING
3183 30    8C FC 01970 PCRLF    LEAX    PCRLS,PCR
3186 86    0D    01980 PDATA    LDA     #$0D
3188 8D    DA    01990          BSR     SEND
318A 86    0A    02000          LDA     #$0A
                 02005 *OUTPUT STRING
318C 8D    D6    02010 PDTLP    BSR     SEND
318E A6    80    02020 PDATA1   LDA     ,X+
3190 81    04    02030          CMPA    #$04
3192 26    F8    02040          BNE     PDTLP
3194 39          02050          RTS
                 02055 *VARIABLE STORAGE
3195             02060 PCNTER   RMB     2
3197             02070 ADDR     RMB     2
3199             02080 NUMBER   RMB     2
319B             02090 DELIM    RMB     1
319C             02100 WINDOW   RMB     2
           0000  02110          END
00000 TOTAL ERRORS
```

Following is the listing accidentally omitted from "Smarts for a Dumb Terminal." The listing explains the operation of the Color Basic ROM routine.

```
/BASIC ROM SCREEN PRINT
A30A    PSHS    X,B,A     SAVE REGS.
A30C    LDX     $88       PUT SCRPTR IN X-REG
A30E    CMPA    #$08      BACKSPACE?
A310    BNE     $A31D     GO CHECK FOR CR
A312    CMPX    #$400     BEGINNING OF SCREEN?
A315    BEQ     $A35D     RETURN IF YES
A317    LDA     #$60      $60=SPACE
A319    STA     ,-X       STORE SPACE&DEC SCRNPTR
A31B    BRA     $A344     STORE SCRPTR&RETURN
A31D    CMPA    #$0D      CARRIAGE RETURN?
A31F    BNE     $A32F     GO CHECK FOR SPACE
A321    LDX     $88       PUT SCRPTR IN X-REG
A323    LDA     #$60      A=SPACE
A325    STA     ,X+       STORE&INC X-REG
A327    TFR     X,D       PUT SCRPTR IN X-REG
A329    BIT     #$1F      END OF LINE?
A32B    BNE     $A323     AGAIN UNTIL DONE
A32D    BRA     $A344     STORE SCRPTR&RETURN
A32F    CMPA    #$20      CONTROL CHAR?
A331    BLO     A35D      RETURN IF YES
A333    TSTA              GREATER THAN $80?
A334    BMI     $A342     STORE ON SCREEN
A336    CMPA    #$40      NUMBER OR LETTER?
A338    BLO     $A340     BRANCH IF CHAR
A33A    CMPA    #$60      UPPER OR LOWER?
A33C    BLO     $A342     IF UPPER PRINT IT
A33E    ANDA    #$DF      MASK BIT 6
A340    EOR     #$40      CONVERT CHAR
A342    STA     ,X+       STRE CHAR&INC SCRPTR
A344    STX     $88       STORE SCRPTR
A346    CMPX    #$5FF     END OF SCREEN
A349    BLS     $A35D     RETURN IF NOT
A34B    LDX     #$400     X-REG=START OF SCREEN
A34E    LDD     $20,X     MOVE CHAR UP
A351    STD     ,X++      STORE CHAR&INC X-REG
A353    CMPX    #$5E0     LAST LINE?
A356    BLO     A34E      IF LESS DO IT AGAIN
A358    LDB     #$60      B-REG=SPACE
A35A    JSR     $A92D     GO TO CLS
A35D    PULS    A,B,X,PC RETURN

A92D    STX     $88       SAVE SCRPTR
A92F    STB     ,X+       STORE CHAR&INC X-REG
A931    CMPX    #$5FF     END OF SCREEN?
A934    BLS     A92F      DO IT AGAIN
A936    RTS               RETURN
```

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3-D Tic Tac Toe takes almost three minutes to load. Running the program brought up some nice introductory graphics in hi-res along with some oscillating sound effects. (The program runs with the speed-up poke, so if your computer does not work in hi-speed you should eliminate line one. There does not appear to be any annoying slowdown in play if you do have to remove the speed-up.) The next prompt is the option to play against the CoCo or another person, after which the 3-D board is generated and displayed.

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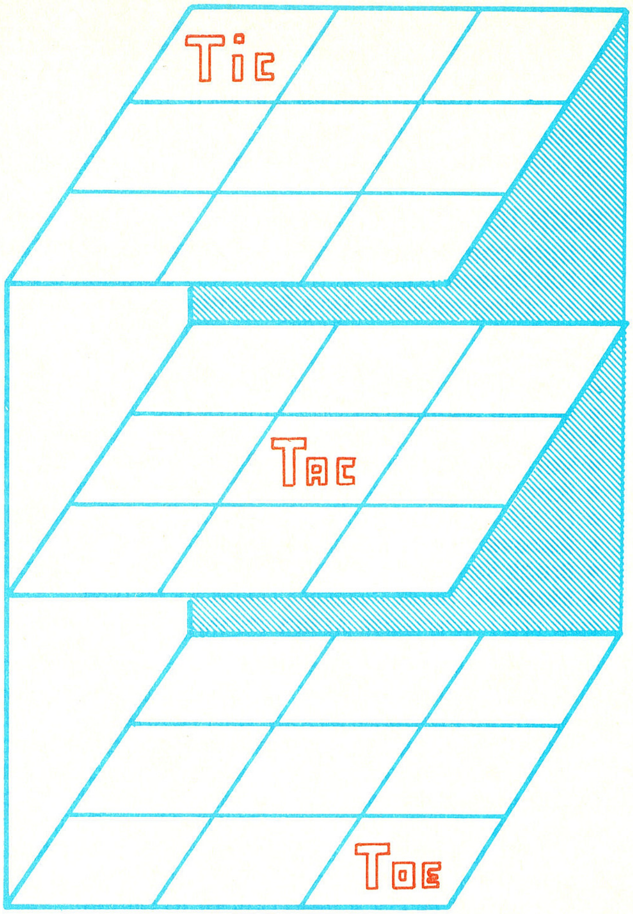

I do drawings part-time in my work and have reproduced the board elsewhere in this review, so that you may see how the 3-D board is achieved. It's a conventional representation of a 3-D cube on a two-dimensional paper (or TV screen in this case) and gives the illusion of 3-D. I know some people have difficulty visualizing 3-D concepts. If you cannot visualize the playing board and the potential tic tac toes in the drawing then maybe this game would *not* be for you! *Then again,* it might be just what you need to finally understand 3-D pictures.

It is easy to become disoriented while looking at the board, though it is well-drawn. Several times I would look up and see the illusion of the cube being rotated a quarter-turn to the left and upward. However, this reorientation does not change the position of the markers nor the playing strategy since things are still in their relative locations. I just want to point out this in case you have not worked with two-dimentional representations of 3-D drawings before.

The graphics are well done in hi-res. The computer moves take from two to four seconds. Human moves (which generally take longer) are made through the four arrow keys and the *ENTER* tab. According to the author, there are more than 150 possible ways to get *Tic Tac Toe,* so games are generally fast, depending upon the human factor.

Documentation is quite complete and gives anyone the necessary information to play all options. However, I do feel the documentation is a little misleading. The programmer points out: "We averaged about a 50 percent win in the games we played against CoCo. But then we had a fair idea of what CoCo was thinking since we told him how to play! One thing you can be sure of is that CoCo will not miss a

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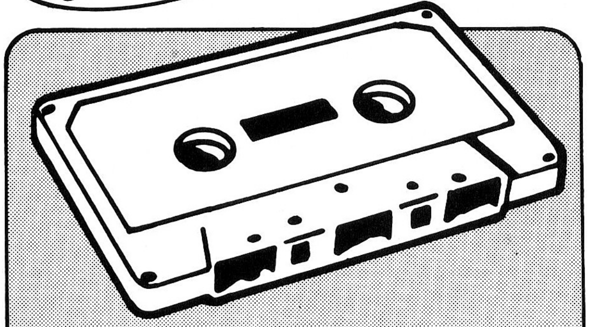

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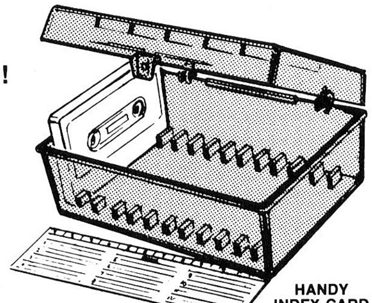

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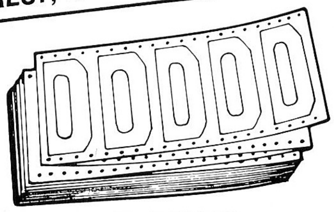

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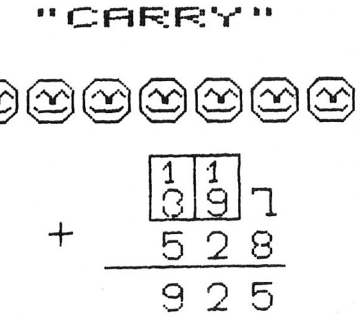
After reading the documentation I was all prepared to play a 'difficult' game of *3-D Tic Tac Toe.* To my disappointment, I won the first game in four moves, then the second game, the third ... until I had won 15 games to the computer's one! Not all games were simple four-move wins, as the loser of the previous game starts the next game. I don't think I would have been so disappointed had I not read the documentation first. After all, I remember the regular game as being *easy.*

Another observation I made—or think I made—is that the computer did not always catch the blocks! So, I tried various combinations and could continuously make CoCo miss a block. Then, in all fairness, I thought maybe I had overlooked something or had received an earlier version of the game and decided to call the author. Both of my disturbing observations were put to rest.

First of all, I want to make it clear that the computer *does in fact* catch all blocks. I was too quick to notice the most obvious block CoCo had apparently missed when in reality I had at least doublechallenged CoCo and CoCo had decided to take a different block than the one I had my eyes on. I had looked at the program and thought, "Gee, with all these *IF/THEN* statements in here, there could easily be a bug or logic statement missing somewhere. (There are over 300 *IF/THEN* statements to check computer moves/wins and human moves/wins, etc. I didn't count them ... I took the author's word for it! He tried data arrays and other methods, but they took much longer for CoCo to react than the way the program is currently set up.)



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Concerning the misleading documentation suggesting a "challenging" game, I would like to point out the program was apparently written with younger people in mind, probably in the range of 5-12. This is the general age group I thought suitable for this program prior to talking with the author. In fact, he said most of his software is aimed at younger people. I think the documentation should reflect this a little more.

For the price, *3-D Tic Tac Toe* has a lot going for it. If you don't have a game like this, it would be a great way to introduce or to build upon 3-D concepts for members of the family. It also makes an adult think a little more. It has good graphics. My older kids will soon be six and nine and they seemed to enjoy the game! The six-year-old could even beat the computer and understand that one mark on each level directly above meant a tic-tac-toe, although the three-level diagonals were harder to understand. Welcomed excitement rang throughout when he was able to beat CoCo!

There are a couple of things lacking in this program that would increase its usability and enjoyment. After a game is won, the screen is immediately erased and set up for a new game. There should be either a timer or a prompt included to allow the player(s) time to see where the tic tac toe was! This change in the program would be most beneficial in helping understand 3-D. That feature and the two suggestions following could be written in by most consumers I think. However, you may have to delete some REM statements or remove excess spaces throughout the program to get all the changes put in, as it's already almost 32K in length. The other two suggestions have to do with the two-player option.

All movements are made using the four arrow keys. When two players engage in this game, it becomes confusing! One person must use the *ENTER* to place his marker, while the other uses the *CLEAR.* Since *ENTER* is the most commonly used key on the keyboard, it is very natural and easy for one of the persons to accidently hit *ENTER* when he wanted to hit *CLEAR.* Needless to say, that game is ruined! It's also annoying for two people to keep shuffling around the keyboard. If the game has to be played from the keyboard it would have been nice to designate pushing "0" for circles and "X" or X's. I would suggest incorporating the joysticks and fire button for two-player response (maybe even for one player).

One last comment about the two-player option is that one person can monopolize the play. There is no check or indication for whom is to play. One human assumes the role of CoCo on the screen's scoreboard, and a person can continue to move and mark the board until he wins without the other person ever having a chance to play! The only check the computer does do is make sure you cannot change a marker already in place. It signals you that you cannot make that move.

In general, the program is easy to play, is good for younger children, and has potential. An interesting version of an old game.

(Q Soft, 1006 Robinhood Dr., Painesville, OH 44077, $14.95 tape, $19.95 disk)

—Kenneth D. Peters

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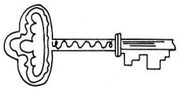

KEYS OF THE WIZARD

by John Gabbard
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Unlock all the doors! Smart creatures follow you throughout hundreds of rooms filled with glittering treasures, magic spells, traps, tricks and puzzles. This exciting machine language text adventure has great sound. Three skill levels allow you to learn easily and work up to expert. Cassette save with random features so you never play the same game twice!

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From Reston Books
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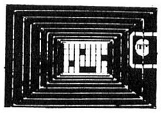

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CoCo COUNSEL

Legal Discussions On The Color Computer

By Tom Nelson

(The information given in this article is not legal advice. If you have legal questions you should see competent legal counsel.)

This month begins a series of columns which will try to answer some of the most-asked questions from software authors, marketers and consumers. It is a wide open forum, and I hope you will feel free to suggest further topics which you would like to see addressed. By the way, for those of you able to attend, I will be giving a short seminar at the upcoming RainbowFest in Chicago on the topic of "How to Market Your Software—And Keep Your Shirt." I hope to see you there.

This first column will not be a discursion into some arcane area of the law. Instead, because some of you may really be in need of some basic legal information about your software immediately, I thought I'd review a brand new book about legal protection for your software entitled "Legal Care for Your Software: A Step-by-Step Guide for Computer Software Writers," first published in 1982. It was written by Daniel Remer, an attorney, is sold by Addison-Wesley Publishing Company, Inc., and costs $19.95 in paperback. Instead of giving you a summary of the contents of Mr. Remer's book, I intend to whet your appetite by setting out an outline of the general contents of the book.

I highly recommend this book to anyone considering marketing software, from author to manufacturer. Mr. Remer, in the span of about 150 pages, presents most of the concepts necessary for you to understand what you must do to protect your software. This book is not legalese. It is practical advice. Instead of telling you what such and such a court said about some intricate legal doctrine, Mr. Remer tells you how to avoid future legal troubles by taking precautions in advance. This doesn't mean, however, that the book is not comprehensive. It is, where it has to be, and Mr. Remer freely cautions the reader when he or she must consult an attorney, such as when a trademark question arises.

After an overview of the need for legal protection and what is available, the author discusses how to practically obtain and maintain trade secret and copyright protection, currently the two main methods of protecting your software. Anything related to a business can be a trade secret, even if others have independently developed it. Thus, marketing strategies as well as source code can have trade secret protection. What you want to do is be able to protect these trade secrets from others, the purpose of trade secret law. The notion of copyrights should be familiar to us all, although the finer points are not common knowledge. Mr. Remer makes both these concepts more concrete. He also points out the present problems of trying to use patents to protect your software and the need to obtain trademark protection for your program name and company logo.

The guts of the work, and that which many of you will find most helpful, is the discussion of contracts. Contracts are the vehicle for all our financial transactions, especially those dealing with our "intellectual property." Mr. Remer has sought to provide the software author and manufacturer with all the necessary contract concepts, including hints on how to negotiate good contracts. What's more, he has provided sample forms for all of these contracts at the end of the book which you can just tear out and use, modified as needed. He stresses the need for written agreements to avoid future disagreements over terms, and to guide our relationships with people we often never meet face to face. I must applaud Mr. Remer's ability to explain these sometimes complicated concepts with ease so that anyone should be able to understand them.

The book introduces you to the concepts of most of the kinds of contracts essential for the sale or development of software. He first discusses work-for-hire agreements which are used to contract with programmers, in-house or not, to write software and allow the software house to retain the copyright. He then discusses agreements to be used to assign your copyright to firms, and license agreements when you don't want to sell the copyright, but only wish to give a company the right to market the software and pay your royalties. He discusses the pros and cons of these two types of agreements, and things to watch out for. For the manufacturer, he also provides information on how to create test site agreements for outside, independent, pre-marketing testing of the software, and information on how to correctly limit liability for defective software. His discussions of these two types of contractual arrangements are excellent and alone are easily worth the price of the book. Finally, Mr. Remer discusses remedies available when the contract has gone sour, and just as important, practical ways to approach legal problems. I particularly appreciated his comment that most legal disputes can be resolved with a bottle of wine and an apology.

It is obvious that Mr. Remer has had extensive experience in the software field. His practical tips alone are well worth the price of the book. The tear out forms, however, are what many of the readers will find most valuable. As I mentioned, he includes examples of all the contracts he discussed, including a trade secret agreement and non-disclosure agreement to keep those valuable company secrets, from source code to marketing strategy, secret; an assignment of copyright agreement for those wishing to sell their program to a manufacturer; a work-for-hire agreement for manufacturers to use when hiring staff or outside programmers; a test site agreement; a license agreement; and a sample disclaimer of warranty. Each of these documents is fully explained in the chapter dealing with the topic, and many alternative clauses are offered to suit varying needs.

The book does, in my opinion, have a few deficiencies. The first relates to different philosophies between me and Mr. Remer about the advisability of people doing their own

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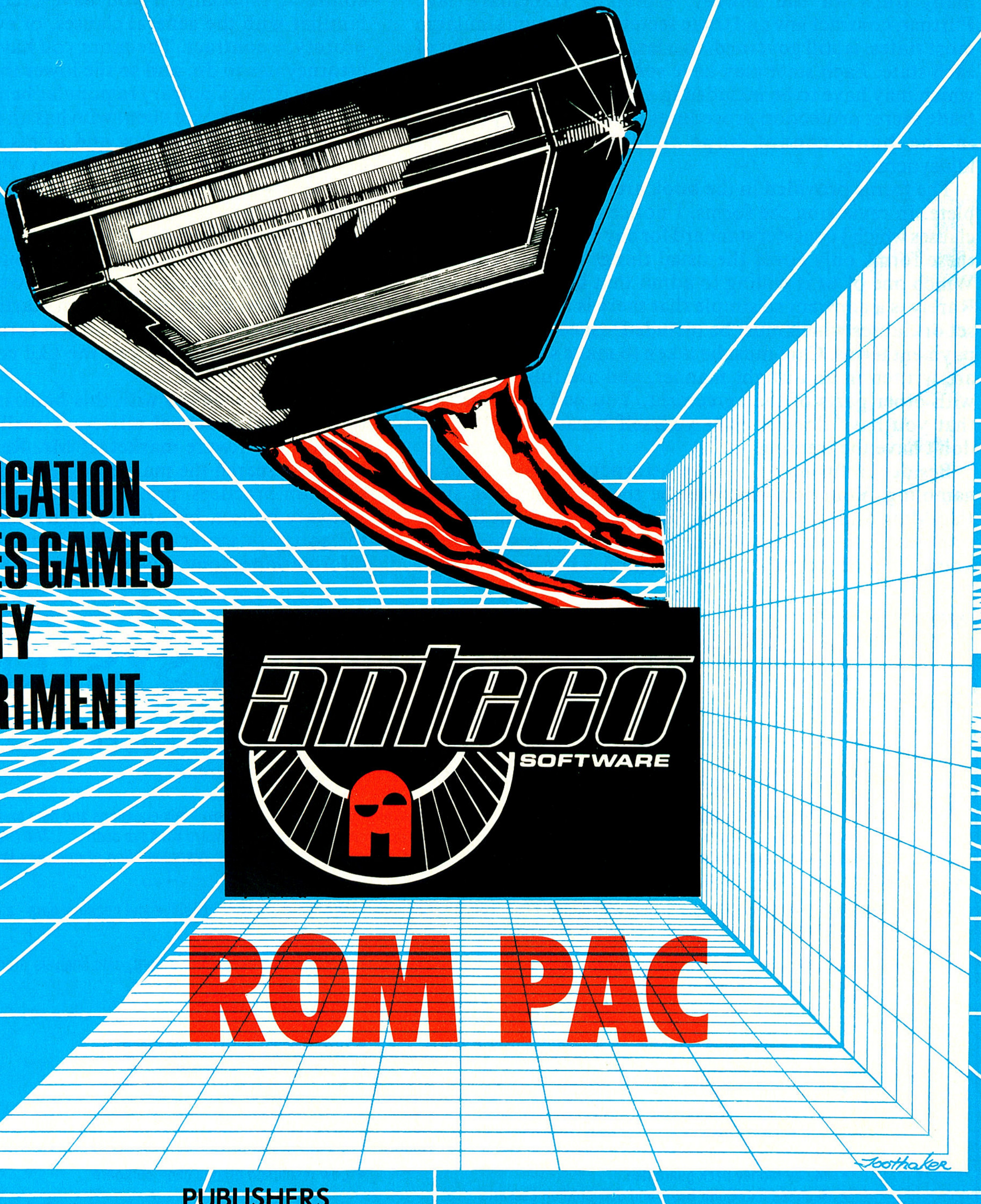

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legal work. Mr. Remer feels that if you read the book and understand the concepts you should be able to use his forms with great success without the aid of an attorney. In general, I disagree.

Although Mr. Remer has done a great job of outlining the basic concepts of contract and intellectual property law, this book does not make anyone an expert. These laws contain many traps for the unwary, especially trademark law. Further, contract law and trade secret law, though similar in most states, is still governed, to a large extent, by the laws of each state. Each state may have some special requirements which may have to be included in a contract, or followed in trade secret protection procedures, and the forms provided in the book cannot hope to deal with such local idiosyncracies.

The forms provided in the book are not necessarily complete. In reviewing the forms, I noticed the lack of several clauses which I consider standard for any contract. Moreover, these forms only cover the usual things put in a contract. Which one of us is willing to admit that he or she is usual? Rarely is a contract so simple that there is not some special set of clauses which must be included, especially relating to payment terms. Care must be taken to make sure the clauses are written in an airtight manner, and are fully consistent with other parts of the agreement. You will never be sure that you have done it right yourself because, really, you don't have the training.

Besides, refusing to hire an attorney is a bad form of gambling. Your software may be the greatest thing since Pac-Man, and worth millions, or it may be a giant flop, or somewhere in between. Unfortunately, it is impossible to know the end worth of your program when you want to present it for marketing. When such money is at stake, it is unwise to venture forth into untested waters of contract law. Why gamble with such an important agreement? Remember, too, that if you commit malpractice with your contract you can't sue yourself, but attorneys are insured to cover such unfortunate, and quite rare, occurrences.

It does not cost that much to consult an attorney on a contract, especially if you have read this book and are familiar with the general clauses, or even have drawn up a prototype contract. The more you have done, the less your attorney has to do, and so the lower the bill. Your attorney will like it too. Contrary to popular belief, most lawyers find it a real joy to have a client who has an understanding of the basic concepts of the law and of his or her problems. Of course, you want to find an attorney who knows a byte from a bit and who has done this sort of thing before. Intellectual property law is a specialty, and if you are paying for expertise you should find someone worth the money.

This advice applies to software houses, too, but I doubt many need the advice, since there are so many other things one needs an attorney for when starting a business. Such things as incorporation or business formation, tax considerations, basic contracts and the like confront the software house from day one.

A second problem with this book is that, although it is rich in legal practical advice, it really lacks information about the software market. If Mr. Remer had spent some time to research the market to inform the reader about the common practices, prices, royalties and contracts used by software houses, big and small, it would be a great help to the software writer in need of a market. This absence of information is somewhat understandable since, as of yet, the

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RAINBOW CERTIFICATION SEAL

software market is still a hit-and-miss proposition, with neither software house nor author sure what is appropriate. There does not yet appear to be any standard contract in the software market like there are in the music and entertainment industries. I plan in a later article to discuss the market forces from the perspective of Nelson Software Systems to at least give some idea of how one software house copes with the market.

One final failing of the book involves a suggestion for an additional chapter. Although Mr. Remer has dealt well with the types of contracts he considers essential to the software author, he has missed two universally used contracts, the software submission agreement and the option agreement. A software submission agreement is used by many companies, including Nelson Software Systems, to protect itself and the author submitting software from future misunderstandings. It sets out the conditions under which the software house will agree to look at the software. This is necessary so that problems don't arise in the future such as a claim that a software house stole a program. It also helps clarify the terms under which the software will be reviewed so that the author can be sure that the software house is reputable. Nothing scares a software house more than receiving a naked copy of someone's source code for evaluation before a submission agreement has been signed. Protect your software by all means, but don't just send it to prospective marketers without first asking for a submission agreement.

An option agreement is a special form of contract in which the software house buys the irrevocable right to decide whether or not to market the submitted software for a limited amount of time, for example 60 days. Such an agreement allows the software house to feel free to devote complete attention to the submission with the knowledge that it has the sole right to market the program if it exercises its option within the given time. The option is irrevocable and, if the software house exercises it, the contract is final, so care must be exercised by the author. On the other hand, option agreements are also good for the software author. The author knows that the software house will take a hard look at the software, and that he or she will have an answer from the software house within the same amount of time, so that the submitted software does not languish in some file months with no response.

I feel that an understanding of these two types of agreements is essential to the software author and the software house seeking programs from outside sources. Therefore, both of these agreements will be discussed more in a later column. Perhaps Mr. Remer will also include a discussion of these in the next edition of his already good book.

I'm sure that you will find this book a gold mine of information which will help you become a success, and help you protect yourself at the same time. You certainly will be better educated and, unlike other books, you will be back many times for more information.

Next month, I will discuss some basic concepts about marketing your programs, including how to time your submission, and how to decide what kind of program to develop. Until then, good luck with your endeavors.

Tom Nelson is a Special Assistant Attorney General for the State of Minnesota representing various state agencies, and a consultant to Nelson Software Systems. Although Tom was trained in Chinese, he turned to law, and then to the computer. In his association with Nelson Software Systems he has written almost all of the manuals for the programs in the Super "Color" Library. He does all his writing on a Color Computer, using—what else?—the Super "Color" Writer II version 3.0.

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SIMULATION

16K ECB

IOWA LEMONADE
~~10¢~~ 5¢
By Paul French
IO
LE

Shortly after I got my Color Computer, I decided to convert a few programs to run on it. *Iowa Lemonade* is the most ambitious of my conversions. The idea and logic have been around for quite a while and one of the other computer manufacturers sends (or used to send) a version out on a demo disk with their disk drives. It was kind of cute, so I decided to develop one for the CoCo. Since a 16K cassette system was top of the line from Radio Shack at the time I started, the program is designed to fit in 16K Extended Color BASIC.

The graphics are all low-resolution. They are produced with the STRING$ statement or by concatenating CHR$ together to make strings that are *PRINTed* at the proper screen locations. The only exception is the lightning (lines 351-362) which is *POKEd* into screen locations read from *DATA* statements (in lines 365-366).

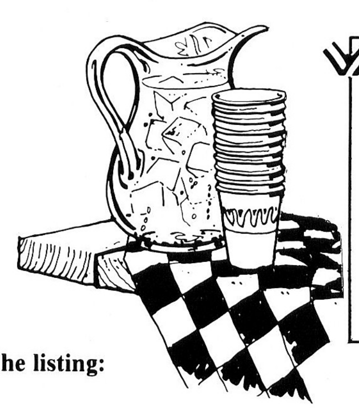
The *POKEs* in lines 367 and 372 take care of inverse video blanks and punctuation marks. I discovered (and have since read elsewhere) that there is a distinct visual difference between the black character that character code 32 produces and the black characters that character codes 128, 144, 160, 176, 192, 208, 224, and 240 produce. I also found that the only way to produce a character in the lower right corner of the display (*PRINT@* location 511) without having the screen scroll is to *POKE* the appropriate value into memory location 1535.

In a 16K Color Computer, you must *PCLEAR1* before *CLOADing* or typing in the program, or you will run out of memory. I'm sorry for some of the lapses in programming style—some of the NEXTs with variable names, some without—some lines with lots of spaces to make them easier to read, a few without. I did try to leave enough comments so you get an idea of what's going on, and the *PLAY* strings all have long variable names so you know what they are. If you want to save a bit of memory, there are over 700 spaces that can be taken out, lots of *REM*-arks, and the variable names beyond two characters can be shortened.

I produced the whole thing on my black-and-white TV. Having since seen it on a color set, I think it turned out pretty well.

The game itself? The computer does the bookkeeping while you and up to 29 friends (or classmates) run your own lemonade stand. It also takes care of the weather and a few other items. Each day, each player has to decide how many glasses of lemonade to make, how many signs to make to advertise, and what the selling price will be for that day. The sole goal is to be efficient at making money. It helps to keep records so you can see what has worked best for you. You can resume a game later, but you have to know what day number it was and how much money players had when they stopped (even though the computer may not allow it all). The game ends when someone earns an agreed upon amount or on an agreed upon day.

Editor's Note: Simulation contest entrants should note that a computer simulation can be created for most anything, from a nuclear power plant to...well, a lemonade stand.)



35	02F5
60	07A4
100	0CC7
145	11FB
186	15D2
227	1986
270	1DB8
315	2197
353	258E
END	2947

The listing:

```
0 '        iowa lemonade
1 CLEAR 450
2 IOWASONG$="T3;P1;O3;L16.;G;A;B
;O4;L2;C;O3;L8;A;L2;G;P8;O4;L2;G
;L8;E;L2;G;P8;L8.;E;L8;G;L8.;E;L
8;G;L2;D;P8;L8.;E;L8;G;L8.;E;L8;
G;L2;D;P1"
3 '   INTRO
4 CLS0
5 FOR I=1 TO 3
6 FOR J=1 TO 13
7 READ CH
8 IA$(I)=IA$(I)+CHR$(CH)
9 NEXT J,I
10 FOR I=1 TO 3
11 FOR J=1 TO 28
12 READ CH
13 LE$(I)=LE$(I)+CHR$(CH)
14 NEXT J,I
15 RESTORE
16 FOR LO=480 TO -96 STEP -32
17 CLS0
18 SOUND 204,1
19 IF LO=-32 THEN 24
20 IF LO=-64 THEN 26
21 IF LO=-96 THEN 29
22 PRINT@LO+9, IA$(1);
23 IF LO=480 THEN GOSUB 45: NEXT
24 PRINT@LO+41, IA$(2);
25 IF LO=448 THEN GOSUB 45: NEXT
26 PRINT@LO+73, IA$(3);
27 IF LO=416 THEN GOSUB 45: NEXT
28 IF LO=384 THEN GOSUB 45: NEXT
29 PRINT@LO+130, LE$(1);
30 IF LO=352 THEN GOSUB 45: NEXT
31 PRINT@LO+162, LE$(2);
32 IF LO=320 THEN GOSUB 45: NEXT
33 PRINT@LO+194, LE$(3);
34 IF LO=128 THEN PLAY IOWASONG$
35 NEXT
36 FOR DE=1 TO 900: NEXT: GOTO 4
6
37 '   CHR$ CODES FOR IOWA
38 DATA 157,152,149,156,157,128,
154,149,128,154,149,156,157
39 DATA 149,128,149,128,149,128,
154,149,128,154,149,147,151
40 DATA 151,146,149,147,151,128,
155,151,147,154,149,128,149
41 '   CHR$ CODES FOR LEMONADE
42 DATA 154,128,128,149,156,156,
128,158,157,156,154,149,156,157,
128,159,128,154,149,156,157,128,
158,157,146,149,156,156
43 DATA 154,128,128,149,146,128,
128,154,149,128,154,149,128,149,
128,154,154,154,149,147,151,128,
154,128,154,149,146,128
44 DATA 155,147,146,149,147,147,
128,154,149,128,154,149,147,151,
128,154,149,154,149,128,149,128,
155,151,152,149,147,147
45 FOR DE=1 TO 250: CLS0: RETURN
46 DIM A(30),L(30),H(30),B(30),
   S(30),P(30),G(30)
47 P9=10
48 S3=.15
49 S2=30
50 A2=2.00
51 C9=.5
52 C2=1
53 '   DEF MUSIC
54 MONEYSONG$="T3;O3;L8;G;F;G;F;
L4;E;C"
55 SUNSONG$="T4;O3;L4;B-;G;D;E-;
G;B-;L2.;O4;D-;C;P1;P2"
56 HOTSONG$="T3;O4;L4;E;C;L1;E;L
8;E;P8;L8.;D;L16;C;L8.;D;L16;E;L
4;C;O3;L2;A;L2.;E;P1"
57 CLOUDSONG$="T3;O4;L8;D;C+;L4;
D;C;C;O3;L8;B;L2.;B;P1;P2"
58 RAINSONG$="T2;O3;L4;A;L8.;A;L
16;A;L8.B-;L16;A;L8.;G;L16;F;L4.
;A"
59 BANKRUPT$="T2;O3;L8;A;L8.;A;L
```

```
8;E;L8.;G;L2;A;P8;L8.;G;L8;A;L16
;EC;L4;O2;A;L8;G;O3;C"
60 '    START OF GAME
61 '    TITLE PAGE
62 CLS
63 PRINT "HI!  WELCOME TO LEMONS
VILLE, IA."
64 PRINT "IN THIS SMALL TOWN, YO
U ARE IN"
65 PRINT "CHARGE OF RUNNING YOUR
 OWN"
66 PRINT "LEMONADE STAND.  YOU C
AN COMPETE";
67 PRINT "WITH UP TO 30 OTHER PE
OPLE, BUT"
68 PRINT "HOW MUCH PROFIT YOU MA
KE IS UP"
69 PRINT "TO YOU (THE OTHER STAN
DS' SALES"
70 PRINT "WILL NOT AFFECT YOUR B
USINESS)."
71 PRINT: PRINT "IF YOU MAKE THE
 MOST MONEY,"
72 PRINT "YOU'RE THE WINNER!": P
RINT
73 PRINT@416, "IS THIS A NEW GAM
E (Y OR N)";: INPUT A$
74 A$=LEFT$(A$,1): IF A$<>"Y" AN
D A$<>"N" THEN 62
75 PRINT@448, "HOW MANY PEOPLE A
RE PLAYING";: INPUT N$
76 N=VAL(N$): IF N<1 OR N>30 THE
N 62
77 FOR I=1 TO N: B(I)=0: A(I)=A2
: NEXT
78 IF A$="N" THEN 115
79 '    NEW BUSINESS
80 CLS
81 PRINT "TO MANAGE YOUR LEMONAD
E STAND,"
82 PRINT "YOU WILL NEED TO MAKE
THESE"
83 PRINT "DECISIONS EACH DAY:"
84 PRINT:PRINT "(1) HOW MANY GLA
SSES OF LEMONADE";
85 PRINT "    TO MAKE FOR THE DA
Y,"
86 PRINT "(2) HOW MANY ADVERTISI
NG SIGNS"
87 PRINT "    TO MAKE (SIGNS COS
T 15 CENTS";
88 PRINT "    EACH),"
89 PRINT "(3) WHAT PRICE TO CHAR
GE FOR"
90 PRINT "    EACH GLASS."
91 PRINT:PRINT "YOU WILL BEGIN W
ITH $2.00 CASH"
92 PRINT "(ASSETS)."
93 FS=0: GOSUB 367
94 CLS
95 PRINT "BECAUSE YOUR MOTHER GA
VE YOU"
96 PRINT "SOME SUGAR, YOUR COST
TO MAKE"
97 PRINT "LEMONADE IS TWO CENTS
A GLASS"
98 PRINT "(THIS MAY CHANGE IN TH
E FUTURE)."
99 PRINT "YOUR EXPENSES ARE THE
COST OF"
100 PRINT "THE LEMONADE PLUS THE
 COST OF"
101 PRINT "THE SIGNS."
102 PRINT: PRINT "YOUR PROFITS A
RE THE DIFFERENCE"
103 PRINT "BETWEEN THE INCOME FR
OM SALES"
104 PRINT "AND YOUR EXPENSES."
105 FS=0: GOSUB 367
106 CLS: PRINT "THE NUMBER OF GL
ASSES YOU SELL"
107 PRINT "EACH DAY DEPENDS ON T
HE PRICE"
108 PRINT "YOU CHARGE AND ON THE
 NUMBER"
109 PRINT "OF ADVERTISING SIGNS
YOU USE."
110 PRINT: PRINT "KEEP TRACK OF
YOUR ASSETS,"
111 PRINT "BECAUSE YOU CAN'T SPE
```

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Forecast general weather conditions with 80% accuracy with this fun, simple to use program. Although not meant to replace National Weather Service forecasts, this program is informative and enjoyable to use. You can even create your own weather by setting the variables!! Provides general forecast including precipitation probabilities. Includes Weather Watch program also all on one easy to use disk.

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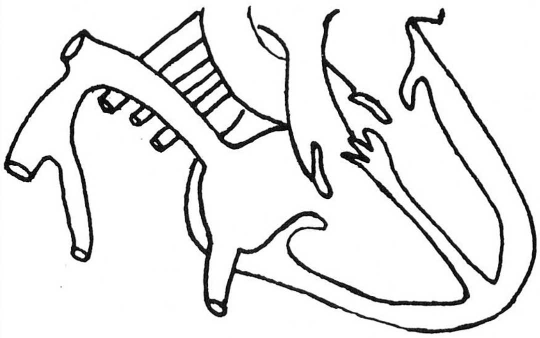

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```
ND MORE"
112 PRINT "THAN YOU HAVE."
113 GOSUB 371
114 GOTO 138
115 '   CONTINUE OLD GAME
116 CLS: I=0
117 PRINT "HI!  WELCOME BACK TO"
118 PRINT "LEMONSVILLE.  LET'S C
ONTUNUE"
119 PRINT "YOUR LAST GAME WHERE
YOU LEFT"
120 PRINT "IT.  DO YOU REMEMBER
WHAT DAY"
121 PRINT "NUMBER IT WAS";
122 INPUT A$: A=VAL(A$): PRINT:
IF A<>0 THEN 126
123 A$=LEFT$(A$,1): IF A$="Y" TH
EN PRINT "WHAT DAY WAS IT";: I=I
+1: GOTO 122
124 IF A$="N" OR I>0 THEN 128
125 PRINT "YES OR NO?": I=I+1: G
OTO 122
126 IF A<1 OR A>99 OR A<>INT(A)
THEN 128
127 D=A
128 PRINT "OK - WE'LL START WITH
 DAY" D+1: PRINT
129 FOR I=1 TO N: PRINT
130 PRINT "PLAYER" I "HOW MUCH M
ONEY"
131 PRINT "(ASSETS) DID YOU HAVE
";
132 INPUT A$: A=VAL(A$): PRINT
133 IF A<2 THEN PRINT "OK - WE'L
L START YOU OUT WITH   $2.00": A
=2: GOTO 135
134 IF A>40 THEN PRINT "JUST TO
BE FAIR, LET'S MAKE     THAT $10
.00": A=10
135 A(I)=INT(A*100+.5)/100: NEXT
136 PRINT: INPUT "          ...READ
Y TO BEGIN"; A$
137 IF LEFT$(A$,1)="N" THEN 79
138 '      WEATHER REPORT
139 SC=RND(0)
140 IF SC<.6 THEN SC=2: GOTO 143
141 IF SC<.8 THEN SC=10: GOTO 14
3
142 SC=7
143 IF D<3 THEN SC=2
144 GOSUB 316
145 CLS
146 '      START OF NEW DAY
147 D=D+1
148 PRINT "ON DAY" D "THE COST O
F"
149 PRINT "LEMONADE IS ";
150 C=2: IF D>2 THEN C=4
151 IF D>6 THEN C=5
152 C1=C*.01
153 PRINT USING "$$.##"; C1
154 R1=1
155 '      CURRENT EVENTS
156 IF D<>3 THEN 158
157 PRINT "(YOUR MOTHER QUIT GIV
ING YOU    FREE SUGAR)"
158 IF D<>7 THEN 160
159 PRINT "(THE PRICE OF LEMONS
WENT UP)"
160 '  THINGS HAPPEN AFTER DAY 2
161 IF D>2 THEN 271
162 '      INPUT VALUES
163 PRINT
164 FOR I=1 TO N
165 G(I)=1: H(I)=0
166 PRINT "STAND" I; TAB(16) "AS
SETS ";: PRINT USING "$$###.##";
 A(I)
167 PRINT
168 IF B(I)=0 THEN 172
169 PRINT "YOU'RE BANKRUPT!  NO
DECISIONS."
170 IF N=1 AND A(1)<C THEN 312
171 GOTO 211
172 PRINT "HOW MANY GLASSES OF L
EMONADE DO YOU WANT TO MAKE";
173 INPUT L(I)
174 IF L(I)<0 OR L(I)>1000 THEN
176
175 GOTO 178
```

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```
176 PRINT "LET'S BE REASONABLE.
 TRY AGAIN.";
177 GOTO 172
178 IF L(I)<>INT(L(I)) THEN 176
179 IF L(I)*C1<=A(I) THEN 187
180 PRINT "YOU HAVE ONLY";
181 PRINT USING "$$###.##"; A(I)
;
182 PRINT " IN CASH."
183 PRINT "TO MAKE"; L(I) "GLASS
ES OF"
184 PRINT "LEMONADE, YOU NEED";
185 PRINT USING "$$###.##"; L(I)
*C1;: PRINT "."
186 GOTO 172
187 PRINT
188 PRINT "HOW MANY SIGNS (";:PR
INT USING "## "; S3*100;:PRINT "
CENTS"
189 PRINT "EACH) DO YOU WANT";
190 INPUT S(I)
191 IF S(I) <0 OR S(I) >50 THEN
193
192 GOTO 195
193 PRINT "BE REASONABLE.  TRY A
GAIN."
194 GOTO 187
195 IF S(I)<>INT(S(I)) THEN 193
196 IF S(I)*S3<=A(I)-L(I)*C1 THE
N 202
197 PRINT
198 PRINT "SORRY, YOU HAVE ONLY"
;
199 PRINT USING "$$###.##"; A(I)
-L(I)*C1
200 PRINT "AFTER MAKING YOUR LEM
ONADE."
201 GOTO 187
202 PRINT: PRINT "WHAT PRICE ARE
 YOU CHARGING FOR"
203 PRINT "FOR EACH GLASS (IN CE
NTS)";
204 INPUT P(I)
205 IF P(I)<0 OR P(I)>99 THEN 20
7
206 GOTO 209
207 PRINT:PRINT "BE REASONABLE.
 TRY AGAIN."
208 GOTO 202
209 IF P(I)<>INT(P(I)) THEN 207
210 IF C5=1 THEN 211
211 PRINT: INPUT "WANT TO CHANGE
 ANYTHING"; A$
212 IF LEFT$(A$,1)="Y" THEN CLS:
 C5=1: GOTO 165
213 CLS
214 NEXT I
215 C5=0: CLS
216 IF SC=10 AND RND(0)<.25 THEN
 296
217 PRINT "  LEMONSVILLE FINANCI
AL REPORT"
218 PLAY MONEYSONG$
219 '    CALCULATE PROFITS
220 IF R2=2 THEN 292
221 IF R3=3 THEN 301
222 FOR I=1 TO N
223 IF A(I)<0 THEN A(I)=0
224 IF R2=2 THEN 234
225 IF P(I)>=P9 THEN 228
226 N1=(P9-P(I))/P9*.8*S2+S2
227 GOTO 229
228 N1=((P9^2)*S2/P(I)^2)
229 W=-S(I)*C9
230 V=1-(EXP(W)*C2)
231 N2=R1*(N1+(N1*V))
232 N2=INT(N2*G(I))
233 IF N2<=L(I) THEN 235   'SALE
S >= PRODUCTION
234 N2=L(I)
235 M=N2*P(I)*.01
236 E=S(I)*S3+L(I)*C1
237 P1=M-E   'PROFIT
238 A(I)=A(I)+P1
239 IF H(I)=1 THEN 296
240 IF I>1 THEN PRINT "  LEMONSV
ILLE FINANCIAL REPORT"
241 PRINT
```

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```
242 IF B(I)<>1 THEN 245
243 PRINT "STAND" I "BANKRUPT":
GOSUB 371
244 GOTO 267
245 PRINT "  DAY" D TAB(22) "STA
ND" I: PRINT
246 PRINT USING " #### "; N2;: P
RINT "GLASSES SOLD"
247 PRINT " $.";: IF P(I)<10 THE
N 248 ELSE PRINT USING "## "; P(
I);: GOTO 249
248 PRINT "0";: PRINT USING "# "
; P(I);
249 PRINT "PER GLASS"
250 PRINT TAB(15) "INCOME";: PRI
NT USING "$$####.##"; M
251 PRINT: PRINT USING " #### ";
 L(I);: PRINT "GLASSES MADE"
252 PRINT USING " #### "; S(I);:
 PRINT "SIGNS MADE"
253 PRINT TAB(13) "EXPENSES";: P
RINT USING "$$####.##"; E
254 PRINT: PRINT TAB(15) "PROFIT
";: PRINT USING "$$####.##"; P1
255 PRINT: PRINT TAB(15) "ASSETS
";: PRINT USING "$$####.##"; A(I
)
256 GOSUB 371
257 CLS
258 IF A(I)>C/100 THEN 267
259 PRINT "STAND" I
260 PRINT " ... YOU DON'T HAVE E
NOUGH MONEY";
261 PRINT "LEFT TO STAY IN BUSIN
ESS."
262 PRINT "YOU'RE BANKRUPT!"
263 PLAY BANKRUPT$
264 B(I)=1
265 GOSUB 371: CLS
266 IF N=1 AND B(1)=1 THEN 312
267 NEXT I
268 R1=1
269 R2=0
270 GOTO 138
271 '   RANDOM EVENTS
272 IF SC=10 THEN 277
273 IF SC=7 THEN 308
274 IF RND(0)<.25 THEN 283
275 GOTO 163
276 IF X1=1 THEN 163
277 J=30+INT(RND(0)*5)*10
278 PRINT "THERE IS A";:PRINT US
ING " ##"; J;:PRINT "% CHANCE OF
 RAIN"
279 R1=1-J/100
280 X1=1
281 GOTO 163
282 IF X2=1 THEN 163
283 PRINT "THE STREET DEPT. IS W
ORKING ON"
284 PRINT "YOUR STREET AND THERE
 WILL BE"
285 PRINT "NO TRAFFIC TODAY."
286 IF RND(0)<.5 THEN 289
287 R2=2
288 GOTO 290
289 R1=.1
290 X2=1
291 GOTO 163
292 PRINT "THE STREET CREWS BOUG
HT ALL YOUR";
293 PRINT "LEMONADE AT LUNCH TIM
E!"
294 FS=1:GOSUB 367
295 GOTO 222
296 '   THUNDERSTORM
297 X3=1:R3=0
298 SC=5:GOSUB 316:CLS
299 PRINT "WEATHER REPORT:  A SE
VERE"
300 PRINT "THUNDERSTORM HIT LEMO
NSVILLE"
301 PRINT "TODAY JUST AS THE LEM
ONADE"
302 PRINT "STANDS WERE BEING SET
 UP."
303 PRINT "EVERYTHING WAS RUINED
!"
```

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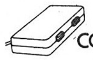
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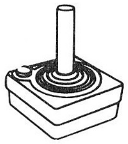
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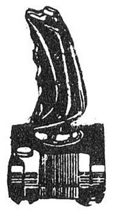
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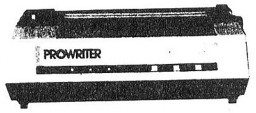

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```
304 FS=1:GOSUB 367
305 FOR J=1 TO N:G(J)=0:NEXT
306 GOTO 222
307 IF X4=1 THEN 163
308 X4=1
309 PRINT "A HEAT WAVE IS PREDIC
TED TODAY!"
310 R1=2
311 GOTO 163
312 FOR I=1 TO 2000: NEXT: CLS:
PRINT@256, "WOULD YOU LIKE TO PL
AY AGAIN?"
313 INPUT IN$: IN$=LEFT$(IN$,1):
 IF IN$="Y" THEN 47
314 CLS
315 END
316 '   WEATHER DISPLAY
317 CLS3
318 PRINT@416,STRING$(64,143)
319 PRINT@144,CHR$(128);"lemonad
e";CHR$(128);
320 PRINT@176,CHR$(128);"for";CH
R$(128);"sale";CHR$(128);
321 FOR LO=208 TO 272 STEP 32: P
RINT@LO, CHR$(165);: NEXT
322 FOR LO=217 TO 281 STEP 32: P
RINT@LO, CHR$(170);: NEXT
323 FOR LO=304 TO 400 STEP 32: P
RINT@LO, STRING$(10,128);: NEXT
324 FOR LO=274 TO 278 STEP 2: PR
INT@LO, CHR$(159);: NEXT
325 PRINT@480,"WEATHER REPORT:";
326 IF SC=5 THEN 344
327 PRINT@36, STRING$(5,255);
328 PRINT@67, STRING$(7,255);
329 PRINT@99, STRING$(7,255);
330 PRINT@132, STRING$(5,255);
331 IF SC<>2 THEN 334
332 PRINT@496, "SUNNY";: PLAY SU
NSONG$
333 RETURN
334 IF SC<>7 THEN 337
335 PRINT@496, "HOT AND DRY";: P
LAY HOTSONG$
336 RETURN
337 PRINT@51, STRING$(10,207);
338 PRINT@82, STRING$(12,207);
339 PRINT@116, STRING$(11,207);
340 PRINT@154, STRING$(4,207);
341 PRINT@186, STRING$(2,207);
342 PRINT@496, "CLOUDY & COOLER"
;: PLAY CLOUDSONG$
343 RETURN
344 PRINT@33, STRING$(13,128);ST
RING$(2,175);STRING$(13,128);
345 PRINT@67, STRING$(12,128);ST
RING$(3,175);STRING$(12,128);
346 PRINT@99, STRING$(11,128);ST
RING$(6,175);STRING$(11,128);
```

```
347 PRINT@133, STRING$(8,128);
348 PRINT@154, STRING$(4,128);
349 PRINT@167, STRING$(5,128);
350 PRINT@496, "THUNDERSTORMS";:
 PLAY RAINSONG$
351 FOR LO=1 TO 2
352 FOR DE=1 TO 123: READ J: NEX
T
353 FOR DE=1 TO 18
354 READ I,J
355 POKE I,J
356 NEXT
357 FOR DE=1 TO 40: NEXT
358 FOR DE=1 TO 18
359 READ I,J
360 POKE I,J
361 NEXT
362 RESTORE
363 NEXT LO
364 RETURN
365 DATA 1160,207,1192,207,1225,
207,1258,207,1291,207,1323,207,1
356,207,1160,128,1389,207,1192,1
28,1422,207,1225,175,1258,175,12
91,175,1323,175,1356,175,1389,17
5,1422,143
366 DATA 1145,207,1178,207,1211,
207,1244,207,1276,207,1309,207,1
145,128,1341,207,1178,128,1373,2
07,1211,175,1406,207,1244,175,12
76,175,1309,175,1341,175,1373,17
5,1406,175
367 PRINT@480, "push  c  to cont
inue   ";: FOR QP=1527TO1534:POK
EQP,32:NEXT : POKE 1508,32: POKE
 1509,27: POKE 1511,29: POKE 151
2,32: POKE 1515,32: POKE1524,46:
 POKE1525,46: POKE1526,46: POKE1
535,32
368 IN$=INKEY$:IF IN$<>"C" THEN
368
369 IF FS=1 THEN CLS:PRINT "  LE
MONSVILLE FINANCIAL REPORT" ELSE
 RETURN
370 FS=0:RETURN
371 '
372 PRINT@480, "push  c  to cont
inue   e  to en";: POKE 1508,32:
 POKE 1509,27: POKE 1511,29: POK
E 1512,32: POKE 1515,32: POKE 15
24,44: POKE 1525,32: POKE 1526,2
7: POKE 1528,29: POKE 1529,32: P
OKE 1532,32: POKE 1535,4
373 IN$=INKEY$:DE=RND(-TIMER)
374 IF IN$="E" THEN 312
375 IF IN$="C" THEN RETURN
376 GOTO 373
```

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Software Review...

Catch 'Em Can Be Catching— Especially For The Young

Ever try juggling more than two balls over your head at the same time? (Hasn't everybody?) That's the kind of feeling you get while playing *Catch 'Em* the first few times through, except that you're trying to keep up with 16 objects wave after wave after wave...

The game, which requires 16K—no Extended BASIC, is deceptively easy through the first five waves, as you maneuver your joystick frantically back and forth catching the missiles in a barrel. But, as you gain in confidence, you also tend to be lackadaisical—and that's when you get in trouble! Splat, the missile hits the bottom of the screen, and the sound effects, combined with the flashing lights, shock you back into reality.

The assortment of objects in *Catch 'Em* includes a crazy collection of thimbles, rockets, flying saucers, Thai fighters, balls, even a Flying I!

You are given three opportunities to catch them and, if successful, you are rewarded with extra barrels. Your running score is displayed at the upper lefthand side of the screen.

If you are not an immediate success, simply pressing the "R" key enables you to sharpen your skills with a new game.

While grownups may want to go on to something "more challenging" (especially if they are continually frustrated), the youngsters will love *Catch 'Em*. For teaching them hand-to-eye coordination, or dexterity with the joystick, there's no better way than with *Catch 'Em*.

(Aardvark-80, 2352 S. Commerce, Walled Lake, Mi 48088, $19.95 on tape)

—Charles Springer

TRS-80 COLOR BASIC
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This entertaining self-instructional book is packed with games, experiments, scores of intriguing challenges, and activities related to fantasy role-playing games. The ideal introductory aid for kids, parents and teachers using the Color Computer.

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Explore the creative and imaginative blending of computers and color. This exciting book will enable you to explore all the graphics capabilities of Extended Color BASIC.

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ASSEMBLY LANGUAGE GRAPHICS
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by DON INMAN and KURT INMAN
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This book is specific to the TRS-80 Color Computer with applications using sound and graphics to illustrate how an assembler can be used to perform feats that would be quite difficult, if not impossible in the BASIC language.

Reston Publishing Company $14.95

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Software Review . . .

Doubleback: New 4K Game Is Challenging, Fun

One day in early March, a package which piqued my curiosity arrived at the Prospect offices of *the Rainbow*. My sixth sense told me there was something inside of extraordinary interest. The red and white label told me it was from Radio Shack.

Thumbing through the colorful catalogs, slick, hard-bound documentation folders, ROM Paks and tapes, I sought to lay hold of that quantity I knew (or maybe just hoped) was there. Most of the stuff I had seen before—Color SCRIPSIT, Color Disk Spectaculator, Bustout—all good programs, too, but where was *IT?* That *bon d' CoCo?* An instant later I would learn that I was but a handful of Sytrofoam pellets away from the answer.

There it was. *Doubleback!*

Doubleback? Could it be? It was a brand new release from Radio Shack, but right there on page one of the documentation booklet it said all the system it required was 4K RAM and joysticks. Not 16K, not 32K, no Extended Color BASIC—just 4K.

Of course, you have to play *Doubleback* before you can really appreciate its economy of programming. It is a thoroughly absorbing—even addictive—game with very nice graphics, well-done sound effects that add to the fun without getting in the way, a challenging scoring system, and a concept that is unique, bizarre and non-violent. It's a great game for kids, if the little things can ever wrestle control from the clutches of their parents. Fortunately for my daughter Laura, two can play the game as well as one, or her mother, who may be the world's first *Doubleback* junkie, would never give her a chance to experience more than the vicarious, second-hand joy that belongs to the spectator.

Just what is it that makes this small program such great fun? Good question. A part of the answer, I feel, lies in the greater sense of control you have over the field of play. That's just a guess. It might be the residual trail that you trace with your joystick, or the mysterious suddenness with which the mystical objects materialize in the field, or the progression of difficulty as your score mounts. Whatever it is, it is a real quantity.

To play *Doubleback*, you patrol the area by moving the joystick to trace a colorful, fading contrail on the screen. As an assortment of objects pops into view, you attempt to circle them, making a complete loop with your trail before it fades. Catching two or more objects in your loop derives bonus points for your score.

Your turn is suddenly terminated when you collide with an object you're trying to circle, or another which might have just popped into your path. Certain objects, like spiders, move on the screen; others appear only after you have reached various threshhold point levels. If you have done so well as to have offended the program master, you will encounter something to slow you down—skulls. Beginning with one and increasing in number up to 10, the skulls appear. They have no point value, they're only there as obstacles to keep you from circling your quarry and to bring your turn to an abrupt halt as you run into them. And, although I haven't encountered it, a warning in the documentation booklet which comes boxed with this ROM Pak states that after 10 skulls you must beware of the unexpected. The context of the word "unexpected" makes me very curious, as the game *Doubleback* is itself a composite of unexpected elements. *Doubleback* is a 4K gem.

(Available at Radio Shack, Cat. No. 26-3091, $24.95)

—Courtney Noe

GRAPHICS

Make This Handy Reusable Graphics Grid

By T. Gray

Planning and plotting graphics, whether on the 80C or another computer, is a time-consuming process requiring a number of sketches. Here are some ideas for making this programming step a bit easier.

The most obvious thing to do is to have the *PRINT @* locations and graphics grid (pages 277-278 in the Color Basic Manual) photocopied. A hundred of these will last a fair while and will provide for many a program. Since such photocopying appears to violate copyright laws, I'm surprised that Radio Shack doesn't supply these grids in newsprint pads.

An elegant solution is to get one of those "magic slates"— the kind where lifting the transparent cover erases the image. From a stationary store, graphic arts supply house, or teachers' store, get a couple of non-washable felt tip pens for writing on acetate (transparencies for overhead projectors). Use the felt pens to draw your *PRINT @* or graphics grid onto the acetate cover of the "magic slate." This will give you a quickly erasable practice sheet for sketching graphics, centering titles or instructions, etc.

A third suggestion is to buy a set of *washable* acetate felt pens in the eight colors of your 80C. You can use these in either of two ways. If you like, you can have an acetate transparency of your grids made (any office with a modern photocopier can do this; or try a printing or photocopying film). You can then sketch in copy or full-color graphics, and erase them with a damp paper towel. An alternative method is to simply tape a clear acetate sheet (readily available at graphics firms, or as page protectors or photo album inserts at drug stores) over the appropriate grid in your manual. The image can be easily moved to different locations on the grid without the need for redrawing. Complete or partial erasure is as simple as a wipe with the damp towel.

Any of these suggestions can help keep you from erasing holes in the grids in your manual!

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TAPE $17.95 **FLEX VERSION $27.95**

CLOCK-With the ever increasing use of digital clocks, more and more young people are unpracticed in the use of the "ANALOG" clocks. You remember those, the ones with the hands. This program will attempt to teach the relationship between the two types of clocks.
REQUIRES 16K EXT. BASIC $14.95

SPELLING TEST is designed to give a standard oral spelling test using the audio track of the computer's tape recorder to dictate test words and sample sentences. Student responses are typed on the keyboard and checked by the computer. Results are displayed on the screen and (if connected) on a printer. **REQUIRES 16K EXT. BASIC $19.95**

MATH DRILL is a program designed to help children to practice addition, subtraction, multiplication, and division skills on the COLOR COMPUTER. It has several features that make its use particularly attractive.
- Up to 6 students may use the program at the same time.
- Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
- Commas may be included in the answers.
- Partial products for the multiplication problems may be computed on the screen.
- Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
- There are ten, user modifiable, skill levels.
- A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
- Skill levels automatically adjust to the student's ability.
- A timer measures the time used to answer each problem and the total time used for a series of problems.
- After a problem has been answered incorrectly the correct answer appears under (above in division) the incorrect answer.

REQUIRES 16K EXT BASIC $19.95

WORD DRILL is designed to give a multiple choice vocabulary quiz. Words and definitions are entered into the program from the keyboard or from a tape file. The computer displays a randomly chosen definition and eight word choices. The student must enter his response before a built in timer reaches zero.
REQUIRES 16K EXT. BASIC $19.95

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ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the COLOR COMPUTER. It has many features that make its use particularly attractive:
- Up to 5 students may use the program at the same time.
- There are 5, user modifiable, skill levels.
- The acceptable percent error may be changed as a student's skill improves.
- A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- The (BREAK) key has been disabled so that a child will not inadvertently stop the program from running.

16K EXT. BASIC $19.95

TEACHERS' DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive.
- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatable.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted.

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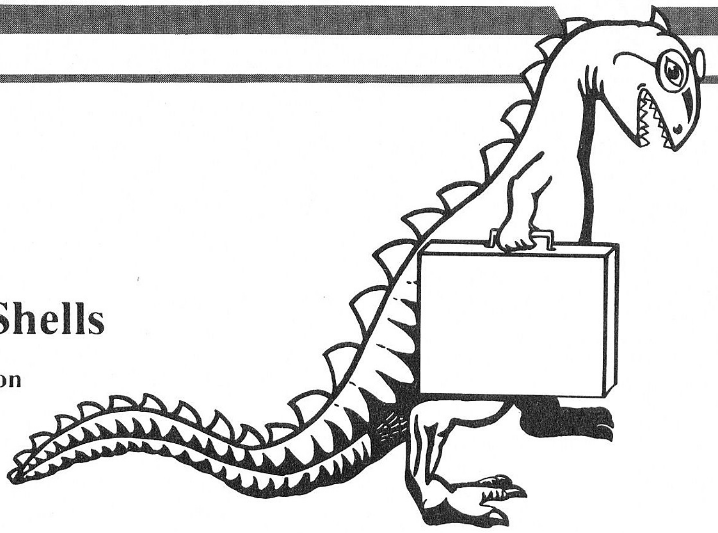


Building Spectaculator Shells

By Robert W. Ericson

As a professional management consultant, I use the CoCo as a tool in my work nearly every day that I am not on the road—and even then, I wish I had it with me. One of the most useful software packages available is *Spectaculator.* I have the ROM cartridge, but I understand that the disk is even more versatile.

In order to use *Spectaculator* efficiently, I found that it is best to set up a few "shells" (pre-designed data displays). I find that by creating "user friendly" output displays (either on screen or printed) I have been able to sell my concepts and analysis much easier.

Included below are three shells that have been the most useful. They are a budget layout, a travel estimator and an expense report. These are presented as examples, and you will want to modify these applications to your own needs.

BUDGET MODEL

The budget shell presented in Figure 1 (one page of a 30-column budget) is used to estimate projects and model alternative budgeting approaches. It saved one client nearly $15 million! To use it, one simply loads the shell from a cassette using the LO "load" command. Next, using the ET "enter text" command, enter the title of the budget on the top and list the direct labor and direct charge items in the spaces in column 1. If more space is needed, the IR "insert row" command does this quite nicely. Next, one may either use the existing task titles or modify them to suit the particular budget. I frequently change them to months of the year.

The next step is to use the EN "enter number" command to enter the rates and times for each labor item. On direct charges, I frequently wish to enter amounts directly and set the rate at 1.00.

Figure 1

```
--------------------------------------------------------------------------------


--------------------------------------------------------------------------------
                           TASK    1     TASK    2      TASK   3       TOTAL

**LABOR**          RATE  TIME    COST  TIME    COST   TIME    COST  TIME    COST
----------------         ------------  ------------   ------------  ------------
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
--------------------------------------------------------------------------------
TOTAL WAGES
FRINGE @ 30.00%       -       -             -             -             -
TOT COMPENSATION
OVERHEAD @ 40%
TOT COMP. & OVHD
--------------------------------------------------------------------------------
*DIRECT CHARGES*   RATE        #    COST          #    COST          #    COST          #    COST
----------------          -----------   -----------   -----------   -----------
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
                              0             0             0             0
--------------------------------------------------------------------------------
TOTAL DIRECT CHG      -
TOTAL PRIME COST              -             -             -             -
G&A @ 15%
TOTAL COSTS
FIXED FEE
TOTAL C&FF
--------------------------------------------------------------------------------
```

SETTING UP THE BUDGET SHELL (12 task/month budget)

ENTER	COMMENT
Set Column Widths	
CW	Enter "column width" command
1, 16	Allows 16 letters in column 1
Set Lines and Text	
ET (see shell)	Enter "enter text" command Enter lines or other characters to give the desired appearance. Note that Column 2 is "rate" Col. 3 is time and Col. 4 is cost. This pattern continues to repeat itself for the remaining months or tasks. Note that Cols. 17 and 18 are an interim total (see formula below). The dash (minus sign) is used to suppress unwanted calculations. In the sample shell, for example, they are used to suppress time being multiplied by fringe benefits. Any non-numeric character will do.
Enter Column Formula	
CF (set cursor on Column number and enter formula listed)	Enter "column formula" command
COL. Formula	

4 IC2*C3	Calculates the Cost of task 1 by multiplying the rate by the time of task 1. (Uses the integer value)
6 IC2*C5	
8 IC2*C7	
10 IC2*C9	
12 IC2*C11	
14 IC2*C13	
16 IC2*C15	
17 IC3+C5+C7+C9+C12+C13+C15	This is needed to calculate an interim total due to the limit on formula length.
18 IC2*C17	
20 IC2*C19	
22 IC2*C21	
24 IC2*C23	
26 IC2*C25	
28 IC2*C27	
29 IC17+C19+C21+C23+C25+C27	This sums up the interim total and subsequent data.
30 IC2*29	

25 ISUMR10	Total wages adds all wages from the beginning of labor (Row 10) and gives the integer value.
26 IR25*0.30	Calculates the fringe rate (30%)
27 IR25+26	Calculates total compensation
28 IR27*0.40	Calculates overhead rate (40%)
29 IR27+28	Calculates total compensation
47 ISUMR33	Totals all direct charges from row 33 down
48 IR29+R47	Adds labor and direct for total prime cost
49 IR48*0.15	Calculates G & A (15%)
50 IR48+49	Calculate total costs
51 IR50*0.10	Calculates profit or fee (10%)
52 IR50+R51	Calculates total cost plus fixed fee

Tips On Use

After entering data delete unused columns and rows. The formula will be automatically adjusted. It reduces calculation time and makes a better looking printout. If you want the left hand stub printed on each page, simply delete the already printed columns after printing each page.

Zeroes are entered under each time and # designation on this and the other budget shells. This serves two functions. The first is to assure the SUM command will work. A gap (no entry) causes this command to not function properly. The second function is to provide a pointer on where to enter data if the column heads are not visible.

TRAVEL ESTIMATOR

The travel estimator (See Figure 2) is a very simple yet handy shell. To use it I enter the trip plan using the ET "enter text" command—for example: "Boston-NY." Then using the EN "enter number" command I enter the number of trips, the estimated number of ground transportation and perdiem required.

I wanted this to fit on one page so I substantially modified the standard column widths.

Figure 2

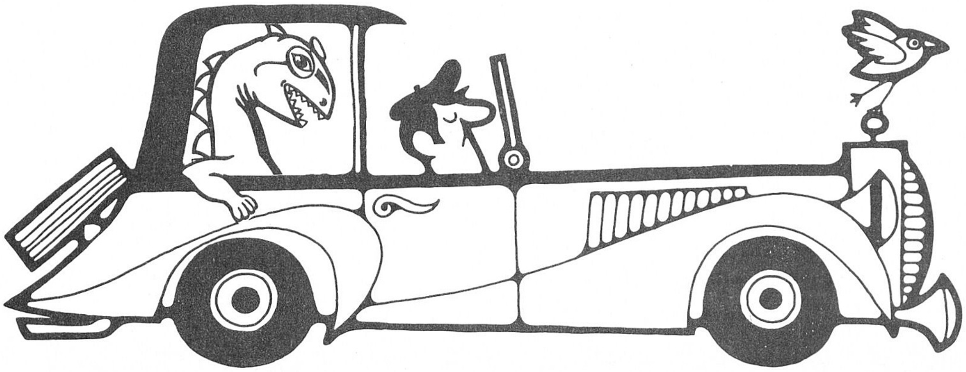
```
---------------------------------------------------------------------------*


---------------------------------------------------------------------------
TRIP PLAN              AIR TRAVEL       GROUND TRANS       PERDIEM      TOTAL
                                                                        TRAVEL
                     NO RATE    COST   NO RATE    COST   NO RATE    COST  COST
-------------------  ---------------  ---------------  ---------------  ------
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
                       1    0            1    0            1    0
-------------------------------------  ---------------  ---------------  ------
TOTAL                  -    -            -    -            -    -
---------------------------------------------------------------------------
```

SETTING UP THE TRAVEL ESTIMATOR SHELL

ENTER COMMENT

Set Column Widths



CW	Enter "column width" command
1,20 2,4 3,4 4,9 5,4 6,4 7,9 8,4 9,4 10,8 11,7	Sets each column width

Set Lines and Text

ET (see shell)	Enter "enter text" command Note that the dashes (minus signs) at the bottom of the Number and rate columns are used to surpress data.

Set Column Formulas

CF	Enter "column formula" command
(set cursor on column number and enter formula listed)	
COL. Formula	
4 C2*C3	Calculate air travel costs
7 C5*C6	Calculate ground trans. costs
10 C8*C9	Calculate perdiem costs
11 C4+C7+C10	Calculates total travel costs

Enter Row Formula

21 SUMR10	Provides total by mode of travel and grand total costs

EXPENSE REPORT

When traveling I often am working for different clients or on different projects. This requires a detailed expense report allowing trips or charges to be separately charged. To do this I use the expense report shell presented in Figure 3. In order to keep up with the paper work I keep a weekly summary of expenses and save it on tape. I keep adding to it until the end of the month, print it out and submit it (for once without math errors—much to my accountant's delight).

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Figure 3

```
--------------------------------------------------------------------------*
                                  DETAILED EXPENSE REPORT
                                      FOR THE PERIOD
                                            TO

                                  CHARGE TO THE FOLLOWING ACCOUNTS
---------------------------------------------------------------------------
EXPENSE                           NUMBER NUMBER NUMBER NUMBER NUMBER  TOTAL
*DATE* ****EXPENSE ITEM *********
---------------------------------------------------------------------------
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
                                        0      0      0      0      0
---------------------------------------------------------------------------
*****************TOTAL************
---------------------------------------------------------------------------
```

SETTING UP THE EXPENSE REPORT SHELL

ENTER	COMMENTS
Set Column Width	
CW 2,27	Enter "column width" command Allows maximum space for item description
Set Lines and Text	
ET (see shell)	Enter "enter text" command Enter titles, lines and information to suit individual needs.
Enter Column Formula	
CF	Enter "column formula" command
(set cursor on column number and enter formula listed)	
Col. Formula	
8 SUMC3	
Enter Row Formula	
RF	Enter "row formula" command
52 SUMR12	Sums all expense items from the beginning (Row 12)

If the entry of these shells is more difficult than you may wish to attempt, the author will provide them to you on tape. Send $15 to Robert W. Ericson, 5 Carriage Dr., Acton MA 01720. He is also available to set up special shell requirements for your personal needs. Please contact him directly.

Utility . . .

Keytones Provides Auditory Feedback

By James Provost

Keytones is designed to produce a tone through the TV speaker every time a key is pressed.

The frequency of the tone may be changed using the *SOUND* command (e.g. SOUND 225,1), but the duration of the tone is set at one.

The user simply keys in the program, runs it and beeps away. This program is useful when punching in a set of numbers. The tone represents positive feedback for each keypress. This method eliminates the need to visually check the screen each time a number is entered. It thus becomes an added utility.

(At *Rainbow*, we like the effect created when you've typed in a line and then hit shift and left arrow key.)

My thanks to Kenneth G. Deahl's article in the February 1983 issue of *the Rainbow*. His reference to the RAM Hook sparked my inspiration.

The listing:

```
1 REM KEYTONES
2 REM BY JAMES PROVOST
10 FOR X=1536 TO 1551
20 READ A:POKE X,A
30 NEXT
40 POKE 360,6:POKE 361,00
50 DATA 52, 86, 198, 1, 134, 4,
61, 253, 0, 141
60 DATA 189, 169, 86, 53, 86, 57
```

Hacker's Helper. . .

Put Your Numbers In A Row

Mike Hall, of Hartland, WI, offers this programming quickie for anyone who needs to right justify numbers (that is, line them up properly for adding, subtracting, etc.). As written, it is for adding two numbers, but once the simple principle is learned, it can be readily adapted to whatever your individual needs may require. Just expand the program by providing for more number inputs (similar to lines 10 and 20) and move the celebrated "bottom line," created in line 120, farther down the screen by using, say, PRINT@ 106 or PRINT@ 138, etc. (increments of 32—or, refer to a PRINT@ worksheet).

The listing:

```
1 'RIGHT JUSTIFIED NUMBERS
5 'USE NUMBERS LESS THAN 100000
10 CLS: INPUT "FIRST NUMBER";A
20 INPUT "SECOND NUMBER";B
30 CLS: C=A:X=10:GOSUB60
40 C=B:X=42:GOSUB60
50 FOR Z= 1 TO 999:NEXT:GOTO 10
60 P=X
70 IF C<10000 THEN P=X+1
80 IF C<1000 THEN P=X+2
90 IF C<100 THEN P=X+3
100 IF C<10 THEN P=X+4
110 PRINT@P,C:PRINT@41,"+";
120 PRINT@74,"------"
130 RETURN
```

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Data Communications And Your Color Computer

By Harry Hardy

In today's world, more and more microprocessor owners have a need to go *on-line* to another computer, usually a large mainframe or some of the more powerful minis. Maybe they want to access a local bulletin board, or even do their shopping and banking at home. There are numerous *on-line* applications, therefore, it is beyond the scope of this article to cover them. What I hope to do is explain the function of the hardware and software required to get *on-line*.

> *"More than likely, you will connect your modem to your Color Computer and a telephone. This method allows you to use what is called the switched network. In other words, after you are all connected, you use your telephone to dial the remote DTE just like a regular phone call."*

On-line simply means establishing a direct connection between our terminal, i.e., Color Computer, and another terminal or computer.

Throughout this article, I shall refer to both our Color Computer and the remote device, whether it be another computer or a terminal, as Data Terminal Equipment (DTE).

I'm sure that if you have checked into the requirements of accessing some of the local bulletin boards you have found out that you need a *modem* and a special software package to run on your Color Computer. Maybe you already have these items. Whether or not that is the case, maybe you don't understand how modems work.

Let's take a look at the modem. Why do we need this? Up until the last few years, in order to get two or more pieces of data terminal equipment (DTE) to communicate with each other you had to use your local telephone company's switching equipment.

This equipment was designed to transmit voice or analog signals whether across the street or across country. These facilities work great for this; however, your DTE puts out what is known as a digital signal. This digital signal is incompatible with the existing telephone voice network.

That's where our modem comes in. Modem is an acronym for MOdulator, DEModulator. Different types of modems can do different things; however, since we are primarily interested in what it does for our Color Computer let's just say that its primary function is to take your Color Computer's digital signal, and convert it to an analog signal for transmission over the telephone lines. At the other end, there is also a modem that takes the analog signal and converts it back to the digital signal for the remote DTE, the same as our modem will do for any replies from the remote DTE.

There are a couple of ways to connect your modem to the telephone network. More than likely, you will connect your modem to your Color Computer and a telephone. This method allows you to use what is called the switched network. In other words, after you are all connected, you use your telephone to dial the remote DTE just like a regular phone call. Once the remote DTE answers your call you hear a high pitched tone, then you may or may not, depending on your modem, simply hang up the telephone and proceed to log on to the remote system.

The other method is to have a "dedicated" telephone line between your system and the remote system. This kind of connection eliminates the requirement of a telephone to dial the remote system, but the hardware to use such a connection is expensive. I only mention using dedicated lines for those who are unfamiliar with data communications so you will know that there are other means to establish a direct connection between DTEs. No matter which method is used to connect these devices, what we now have established is what is known as a *data link*.

Once we have established our *data link* there is a certain line discipline or protocol that has to be followed in order to communicate with the remote DTE. This is where that special software package you have to buy comes in.

The type of transmission we will be doing between our Color Computer and the remote DTE is called *asynchronous* transmission. Asynchronous transmission is a type of protocol and is defined as "that type of transmission that sends one character at a time and lacks any continuous synchronous agreement between the DTEs." Normally, this character consists of 8 to 11 bits.

Let's back up a minute for those newcomers who may not know what a *bit* is. A bit is the smallest unit of information within a computer system. This unit of information is an electrical charge that is either off (0 state) or on (1 state). A sequence of seven 0s and 1s are used to make up a character in the Color Computer. These seven bits are referred to as ASCII codes. For example, the ASCII code for the letter "A" within your computer is represented by the seven bits 1000001. Please note that not all computers use ASCII codes internally to represent characters; however, we will not get into those type of codes here.

Just a bit of history on ASCII. This code was first developed in 1963. The letters stand for "the American National Standard Code for Information Interchange," also called ANSCII. The version modified in 1967 is called ASCII II and is the same code that is referred to as ASCII today.

Our Color Computer uses ASCII code to represent all of its letters, numbers and special characters.

I heard that. Someone out there said, "Hey, I thought my computer stored things in hexadecimal or *Hex*." Let's take a moment to look at that. I don't want anyone to become confused between ASCII and Hex.

Hexadecimal is a numbering system with a base of 16 characters as opposed to 10 in the more familiar decimal system. The numbers 0-9 and the letters A-F are used. Eight bits, or one byte as it is called, makes up a hexadecimal character. Your Color Computer uses the Hex numbers for computations and addressing, etc.

Now suppose we *PEEKed* at a byte of memory and found the Hex character there was a 41. Remember I said each byte was made up of 8 bits, well, if you were to look at each bit, that Hex 41 would look like this: 01000001. That value, if converted to a decimal, would be 65. Now, suppose we wanted to print this byte of data, what do you think would come out on the printer? Give that person in Baltimore an A, for that's exactly what would print, the letter A. Now, suppose that location we *PEEKed* at had a Hex FF in it, and we tried to print it, what do you think would happen? That's right, nothing would print. Why? Well, that Hex FF, although it is a valid Hex character, is an invalid ASCII character. So, in essence, we can say that your computer stores ASCII characters as if they were Hex characters. (For a more in-depth look at Hex, see the article, "All You Wanted To Know About Hex," in this issue.)

But wait a minute, I thought that an ASCII character only had seven bits, what about that 0 in bit 8 (counting from right to left). Remember, I said that to transmit a single seven-bit ASCII character usually 8 to 11 bits would be sent out over the telephone line. Well, let's see if we can understand why.

I will use for our example the printer driver built into our Color Computer. This routine is similar to an output routine found in software packages required to communicate with a remote DTE. Depending on which version of Color BASIC you have, the number of bits sent to the printer is either 9 or 10. I will be using version 1.1 since it most resembles an asynchronous output driver. Our Color Computer will be using an asynchronous line discipline when we go on-line with a remote DTE. Well, this protocol uses framing bits called *start* and *stop* bits to surround each character. The *start* bit will precede the character and the *stop* bit will follow the character. Remember, asynchronous protocol is "that type of protocol that sends one character at a time, and lacks any continuous synchronous agreement between DTEs."

Without getting into the electronics of our modem, let's just say that these start and stop bits are used to help get the receive modem synchronized with the sending modem. This synchronization is required so that bits are not lost before we get them.

These bits are used by the protocol also as framing characters. How do they get there and what happens to them? Simply put, they are added by the sending end and removed by the receiving end. Let's see why. Look at our version 1.1 printer driver again. This driver sends eight data bits preceded by one start bit and followed by one stop bit. The start bit is a 0 bit while the stop bit is a 1. Imagine now that our printer is a remote DTE. When the remote DTE sees the 0 bit or start bit it knows that the next eight bits represent a character that it has to act upon. It will then assemble these eight bits and, in our case, print it. The stop bit will indicate to our remote DTE the end of the character and start monitoring the line for another start bit. (Although our driver is sending only one stop bit, two stop bits may be more common. In either case, each end will have to be aware of the actual number.)

You may be wondering why even send a stop bit. Why can't we just start looking for another start bit, or even better yet just assemble each group of eight bits for a character? Well, we just can't arbitrarily assemble bits and expect to get meaningful data. Suppose our DTE just sent the data bits. During this transmission, let's also suppose, for whatever reason, that one of these bits gets destroyed. We would now start assembling bits from two characters that could cause some strange results.

Now you know what those extra bits are, and what their purposes are; well, almost all of them. Remember, I said our driver sends eight data bits, not seven. We know that seven bits make up an ASCII character. What is that extra bit for?

That eighth bit serves another purpose in asynchronous protocol. That purpose is a parity bit. This parity bit is a method of error detection. There are three terms used for this parity checking; *even parity, odd parity,* and *no parity*. The method chosen is up to the designer of the DTE, therefore, our communications software must know which method is used at the remote end. Let's take a look at these methods.

First, even parity. It has been my experience that this method is the most common one used. (I know as soon as you read this the first terminal you will see will use one of the other two; Murphy's law is sure to get me.)

What your software does using the even parity method is this: it counts the seven data bits of the ASCII character. If the total number of 1 bits is an odd number it sets the eighth bit to a 1, thus ensuring an even number of 1 bits. If that total is even, it leaves the eighth bit a 0. Look at our letter A again.

IMPORTANT NOTICE ABOUT SUBSCRIPTIONS

The "May" issue of *the Rainbow* will carry a cover date of June this year. As far as the cover dates are concerned, there will be no May issue.

The reason for this is simply a cosmetic one. We would prefer, and think that you would prefer, to get a particular issue of *the Rainbow* in advance of the month which appears on the cover rather than in the middle of the month which appears on the cover.

What this means is that your June issue will arrive before the first of June, and that our big July Anniversary issue will be in your hands before the first of July.

There will be no "break" in magazines and absolutely no change in the number of issues you will receive. This will be obvious from next month's (not this month's) subscription label—which will show an expiration date one month later than the date shown this month.

You will still get 12 issues of *the Rainbow* with a year's subscription. All the change means is that your subscription will "expire" one month later than usual. And, you will still get a copy of *the Rainbow* every single month at about the same time. The only difference is that it will appear that you get your subscription copy "earlier" than before.

So, you will not be "missing" an issue in May. But the issue which arrives in May will carry a June cover date. That's actually the only difference—a cosmetic one which will make it appear that you get your *Rainbow* earlier than before.

The bits for an A are 1000001. If we add these up, you can see that we have an even number of 1 bits, therefore, that eighth bit would remain a 0; however, the letter C consists of these seven bits, 1000011. Since these bits will add up to an odd number of 1 bits, we would set that eighth bit to 1 giving us an even number of 1 bits.

Odd parity works just the opposite. If the total number of 1 bits is odd, then bit 8 is left 0. If the total is even, the eighth bit is set to a 1.

The last one, no parity, means just that. The eighth bit is left as is, 0. This is the method our 1.1 printer driver uses. After all, it is unlikely, given the short distance a bit has to travel from your printer port to the printer, that it would ever get destroyed.

What about the receiving station? It does basically the same thing. It counts the seven data bits and, according to which method is being used, checks the eighth bit accordingly. If it's not what it should be, then we know that there was some type of transmission error. As with our printer driver, chances are the communications software you buy will use the no parity method of transmission. You will see why in a moment. The only way you will know if there was an error is by one of the oldest methods used. The receiving end simply echoes the character it received back to the sending end—you. If the character displayed corresponds to what you entered, all is okay; if not, you know immediately that something went wrong. You can probably see the problems with this method. You don't know if the bad character was due to an error at your end at transmission time, or at the other end, when the character was echoed back.

While parity checking adds to the ability of our system to detect errors, it also has its flaws. Consider, if you will, that some type of error caused two bits to change value, i.e., 01000001 was changed to 01000010, we still have a valid parity check and even a valid character, but it is not the character sent. That 01000001 is the letter A, which is what was sent; however, the 01000010 is the letter B.

What to do about these transmission errors? Well, all the software that I'm familiar with, at least for the Color Computer, doesn't do anything with these types of errors except try to display them on your screen whether they are responses from the remote DTE or your transmission being echoed back. The reason is simple. The more sophisticated error detection methods, especially error recovery, are costly to implement and, for the most part—I realize there may be exceptions—are not implemented in asynchronous protocols for the smaller micros.

But, really, do we need that type of sophistication when all we want to do is access our local bulletin boards? I don't think so. Besides, although it may sound like transmission errors are a real big problem for you, they probably are not. If you are having some problems, chances are it could be in the telephone connection you have. After all, using the switched network for data transmission is not the best method, but, in our case, we probably would rather sacrifice quality for cost. If errors are a continuing problem for you, it may be in your modem. Maybe you should have it checked.

Next month, I will cover in greater detail some of the error detection and recovery methods that can be used, and introduce you to some new terms describing three modes of data transmission.

I hope you now have a better understanding of what that modem and the special software package you must buy, or have bought, does for you and your Color Computer.

Software Review . . .

A 'Fine' Weather Program Is *Weather Watch*

Do you want to track weather trends in your area, or study how the temperature affects energy use in your house? *Weather Watch* can help. It won't predict the weather, or tell you when to wear your galoshes, but it does provide a convenient file of weather data.

Weather Watch is a package of three programs. The first, *Daily Data Entry*, allows you to enter each day's high and low temperatures, and amount of precipitation, and store it on tape. The third program, *Daily Entry View,* allows you to review one day's data previously stored.

The second program, *Monthly Summary,* is the heart of the package. It reads a month's worth of data from tape, and summarizes it in every imaginable way. It repeats the data you entered, and gives the daily average, range, and number of heating and cooling degree days. Heating degree days are the number of degrees the daily average is below 65 degrees. Cooling degree days use degrees above 65. These provide a good indication of how much you will have to heat or cool your house. The program then summarizes monthly totals, maximums and minimums. The report is nicely formatted, in tabular form, and it is easy to find the data your want. You may either display the monthly report on your screen, or send it to your printer.

While the program performs all the functions described in the manual, it has some flaws. The most serious is with data formats. In programs 1 and 3, dates must be typed in exactly this format: JUL/03/82. If you type JUL/3/82 instead, the program will be unable to find your data later. While a regular user would quickly get used to the required format, a single error could ruin an entire month's data tape. There's really no excuse for not adding the few lines of code necessary to verify the format.

In addition to this design flaw, there's an actual bug in the second program. If you store two months' data on one tape, the program will read the first month's data, regardless of which you request. The distributors have assured me this bug is being corrected.

If you study the weather seriously, then you might need a more sophisticated analysis than this package provides. But if you want to record and summarize daily temperature and precipitation data and the other functions provided here, this program is "fine."

(Petrocci FreeLance Associates, 651 N. Houghton Rd., Tucson, AZ 85748, $24.95)

—David Finkel

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Hardware Review . . .

Super-Pro Keyboard Is An Excellent Hardware Offering

The newest entry in the replacement keyboard sweepstakes is a fine piece of hardware from Mark Data Products called the *Super-Pro*. It is aptly named—it is super and it is professional, too.

We confess that we always liked the CoCo keyboard. Although the numbers of people who said something less than complementary about the "flat" and "shallow" CoCo keyboard were and are many in number, it always appealed to us. In fact, we were able to do some of the fastest typing we ever did with the CoCo keyboard.

But in all honesty, we like the *Super-Pro* just as well. And, we are certain, touch-typists will think it a vast improvement. Here at *the Rainbow*, those who do touch-type like it a whole lot better.

For our part, the feel is excellent and the keys have the proper amount of "give" that make you feel like you are getting some feedback from what you put in—but not too much. The keytops are gently sculptured and the letters are large size. Yes, throughly professional.

The *Super-Pro* appears to be very much like (if not exactly like) the Model I keyboard—but there is no "bounce." We tried to make it bounce, but were not successful. The keys are all the same color, which may or may not be an advantage for you.

What *is* an advantage is that the keyboard layout is exactly the same as that of the CoCo. So, aside from a better feel and more dressed up appearance, you do not have to "relearn" the keyboard. A decided bonus.

The *Super-Pro* is advertised as a kit, and, in the most strict sense of the word, that's what it is. There is a little more to the installation than just plugging it it, but not a great deal more.

You install *Super-Pro* by opening the CoCo case, unplugging the old keyboard connector, and positioning the *Super-Pro* into the empty space. The keyboard has four little adhesive pads which can be used to stick it firmly to the bottom of the case.

The worst part of this whole process was dealing with a plastic post that sticks up in the middle of the bottom of the CoCo's case. The post has to be partly cut off—for which you need some sharp cutters. The *Super-Pro* instructions say that the post is not needed, even if you decide to put the old keyboard back in. We were able to confirm that.

A couple of plastic washers are also supplied to even up a dressing panel which "fills in" the space between the CoCo case and the *Super-Pro* when you put your computer back together. Dealing with this dressing panel looked like it was going to be complicated, but was not.

All in all, installation took about 15 minutes. And that included the time it took to cut off the top of the little post. No big deal, not even for someone who is not especially handy. Having the dressing panel provided a bonus in that it made it easier to plug the *Super-Pro* into the computer.

Some Color Computers—those built after about October, 1982—and all TDP-100's require a special adapter to mate the keyboard with the computer. This is an easy procedure to follow, however, and would add about a minute to the installation time.

The *Super-Pro* has been with us for several weeks now. Our touch-typists like it a great deal and those of us who hunt and peck also find it to be an improvement over the CoCo keyboard.

In sum, *Super-Pro* is an excellent and high quality keyboard that answers a real need voiced by many CoCo owners. If you are searching for a replacement keyboard, it is an excellent buy.

(Mark Data Products, 24001 Alicia Parkway, No. 226, Mission Viejo, CA 92691, $69.95; adapter, if needed, $4.98 additional)

—Lawrence C. Falk

PoEDIT License...

BASIC Shakespeare

By H. Allen Curtis

Oh what a rogue AND peasant SAVE am I.
All the world's a SCREEN.
The PLAYs the thing.
TO GO OR NOT TO GO.
My kingDIM FOR a MOTOR.
Ah, that's the RUN.
SomeSTRING$ rotten in REMark.
SOUND AND fury, SGNifying nothing.
Is that a JOYSTK which I see beFORe me?
AUDIO, AUDIO, whereFORe art thou, AUDIO?
RESET damn spot.
DIMension is the better part of VAL OR.
All's DEL that ENDs DEL.
Good-night, sweet PRINTs.

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Paging Down Memory Lane:

It May Look Like Garbage, But It's Gold

By Richard Krankoski

This program gives you a look at memory in real time. It's original purpose was to look for command words in a machine language Adventure game, but it became a visual aid tool used with some CoCo tutorials and "how-it-works" articles. By selecting blocks of memory or "pages," you can see the buffer areas in low RAM as they are accessed and changed, the operation of the stack, the structure of the program itself, and the execution or results of many BASIC instructions. The program can also be used to examine text or graphics of other programs.

The program works by controlling the video screen display offset registers and the display mode registers in the SAM and VDG hardware. Lines 160 through 210 control the display offset in increments of 512 bytes. Lines 310 through 360 control the display mode, either text or one of the PMODEs in color set 1.

> *"In the text mode, the screen displays the contents of 512 consecutive bytes of memory in the form of 16 lines by 32 characters per line."*

The following control keys are used:

UP ARROW/DOWN ARROW—increments or decrements the display offset by 512 bytes.

"T"—selects the TEXT mode.

"O" through "4"—select the graphics PMODE in color set 1.

"N"—displays a message to let you specify a particular page number.

"#"—displays the message screen that tells what part of memory is being displayed.

"E"—executes any instructions that you add between lines 400 and 500.

Note that we are defining a page as being 512 consecutive bytes of memory. Page 0 consists of memory locations 0 through 511. Page 1 consists of memory locations 512 through 1023. We are referencing the page size to the text mode, so don't confuse the pages with those mentioned in articles about graphics. In the text mode, the screen displays the contents of 512 consecutive bytes of memory in the form of 16 lines by 32 characters per line.

What you will see displayed in the text mode is a screen code equivalent of the value stored in a memory location. This is not always the same as the ASCII character. For example, a byte value of zero will be displayed as an inverse video @ sign. You can find a list of the differences on the Nanos System reference card for the Color Computer. To see the difference, run the short program in Listing 1.

The reference card is handy for determining the value of an address while looking at the screen. Be careful of getting a byte value in the buffer areas by *PEEKing* the address, because you are looking at the memory value in real time. If you change the running conditions, you may change that address's value.

When a graphics mode is selected, the amount of memory displayed increases to 1536 bytes for PMODE 0, 3072 bytes for PMODES 1 and 2, and 6144 bytes for PMODES 3 and 4. However, the memory page reference will still refer to the text screen page size of 512 bytes, and the arrow keys will still change the offset by 512 bytes. Therefore, in a graphics mode, the message screen page number will refer to the first 512 bytes of memory being displayed and not to a graphics page number.

Listing 1:

```
SCREEN CODE VS ASCII CODE
1 CLS
2 FOR V=0 TO 255
3 PRINT @ 32, V
4 POKE 1066,V
5 PRINT @ 46, CHR$(V)
6 FOR T=1 TO 300: NEXT T
7 NEXT V
```

If you want to follow along on a short guided tour through the program and through RAM it will be helpful to start from the same point. Before loading in the program, turn your computer off and then back on so that we have the same initial conditions and a "clean" memory. Also, if you have more than 16K of RAM, do a *CLEAR* 200, &H3FFF in the direct mode. This will bring the stack and *CLEARed* area to the top of the 16K space. Certain hardware configurations such as my piggyback RAMS on a REV D board will not display an offset above address $3FFF.

Load and *RUN* the program. The prompt will ask for a page number from 0 to 31. (Remember, my display limit is 16K which is 32 pages.) *ENTER* 0. The next screen tells you what part of memory will be displayed. Press *ENTER*. You now see the first 512 bytes of RAM and can see that there is a lot of activity. CoCo is doing a lot more than checking for a keypress in the PAGER program.

If you loaded in from tape you will see the program name near the bottom-right of the screen. Trying hitting some keys other than control keys and you will find a keyboard buffer. To find the two byte timer, press the shift and "@" keys at the same time. Everything else comes to a stop. You may want to get your copy of *Rainbow*, August 1982, which has a list and description of some of the addresses in this part of memory. It shows the timer addresses as (HEX) 112 and 113. Press one of the keys repeatedly and watch addresses (HEX) 24 and 26 (decimal 36 and 38) near the start of the second line. These locations appear to be some kind of keystroke counters.

If you hit the "E" key you will execute the *SOUND* instruction in line 410. Before moving on, *BREAK* the program and add line 420.

```
420 Q=JOYSTK(0):GOTO420
```

RUN and go back to page 0, then hit the "E" key. By moving the joysticks you will find the four addresses that store the joystick pot values. To go on, you will have to *BREAK* and delete line 420, then *RUN*.

Go back to page 0, then hit the up arrow. This puts you on page 1, a quieter workspace with a lot of bytes displaying the inverse video @ sign which is a value of zero. In the center of this area is a large I/O buffer. You will probably see a part of the program or a part of your keyboard entries here. A few addresses have nonzero values that change under certain conditions but I haven't found a source that identifies them (hex 729-732 and hex 981-991).

Hit the up arrow again—just one time. It looks like a normal text screen. Everything is there except the cursor. That's because we moved up to page 2 which is the memory area normally used to display text, except that we are not in a normal text mode. Therefore, no cursor. We have changed the display offset registers but have not executed a text screen function such as *INPUT* A$. What you see is whatever was last displayed in a normal BASIC text mode which puts its data into memory locations hex 400 to hex 5FF. If you have followed along faithfully the top of the screen should say, "PAGE 0 OF TEXT MODE" along with page zero's address data. Now, hit the "#" key and the proper data is put on the screen along with the cursor. Since you are displaying page 2, when you hit *ENTER* there will be no change except that the cursor will go away because we are at the INKEY$ part of our program.

If you have seen a machine language program that puts a display on the screen while it continues to load, you can now see how it is accomplished. The program begins loading somewhere below page two and the values loaded into addresses hex 400 to 5FF are those required to put a SET/RESET graphics block picture together.

Hit the up arrow again. You will see bands of @ signs and bands of orange. A solid orange block results from a byte value of 255. This data is put into memory during the start-up routine when the computer is turned on. Every 128 bytes you will see one or two bytes with values other than 0 or 255. I don't know what their significance is. They are different values from one power up to another.

Now is as good a time as any to introduce the graphics modes, so try the "0" through "4" keys. Hit the 4 key to get into PMODE 4, then SHIFT #. The screen now tells you what part of memory is being displayed. It should say

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addresses 1536 through 7679 (hex 600 through 1DFF). This space comprises the first four graphics pages which are reserved as part of the start up routine. For a quick demonstration, *BREAK* the program and add line 450.

450 PMODE 3,1:PCLS

Now, *RUN*, select page 3, select PMODE 3, then hit the "E" key. Line 450 did a PCLS on the first four graphics pages. All of the bytes have been set to zero. The "T" key will present you with a screen full of inverse @ signs.

BREAK again and add line 460 and line 470.

460 CIRCLE (100,100),30,7
470 PAINT (100,100),6,7

RUN, get page 3, PMODE 3, and hit "E" again. Try the other modes and the arrow keys and repeat the "E" key. This should help you to understand some of the graphics concepts.

While paging up and down you probably saw a band of hash rise from the bottom of the screen. Select PMODE 3 or 4 and page up the hash until it is at the top of the screen, then hit the "T" key. You have found the start of the program as it resides in memory. The "#" key will show you that it starts at address 7680, page 15.

Increment up a couple of pages to see the rest of the program and the variable storage area. Beyond that are more bands of zeros and 255s except for page 31 which we will get to shortly. For now, let's see how you get more memory from the PCLEAR command. *BREAK* the program and in the direct mode type in PMODE 0 : PCLEAR 1 then *ENTER*. *RUN* and select page 6 in the text mode. You now see that the program has been moved lower in memory starting at address hex C00. To get a better perspective select PMODE 4. You can see that the program data was also left in its original location, but it is no longer serving any purpose because the system's pointers have been reset to point to the new program area. The address space of the original program can be used for other purposes. More memory is available for program lines and variables, but less is available for graphics. You can see that our picture got clobbered.

> *"The space above the program hash is the area commonly known as the PCLEAR 0 area for which there is no valid BASIC command. Right now it is the only place that you can put high resolution graphics."*

Use the "N" key to select page 3 while staying in PMODE 4. The space above the program hash is the area commonly known as the PCLEAR 0 area for which there is no valid BASIC command. Right now it is the only place that you can put high resolution graphics. Hit the "E" key. The FC error appeared because we are now trying to draw in the wrong place in the wrong mode. The area is now reserved for programs and variables. Change line 450 to read PMODE 0,1:PCLS and then *RUN*, select page 3, PMODE 4, and then hit "E." Did you get two circles? Hit the "0" key and maybe they will go away.

By the way, as you may have seen elsewhere, you can use that last part of memory for program memory by entering POKE 25,6:NEW in the direct mode *before* loading or writing a program.

The last stop on this tour is the stack area and the CLEAR command. Go to the text mode and select page 31 ("N"...etc.). If you have 16K or you executed the *CLEAR* 200,&H3FFF instruction at the start of this article, you are now looking at the stack area in action. The microprocessor uses this area for temporary storage of its register's data. Some of what is going on here is related to the activity you see on page 0.

At the bottom of the screen is the area that was reserved by the *CLEAR* command. *BREAK* the program and type in *CLEAR* 20 in the direct mode. *RUN* and get back to page 31. The space reserved for strings has been reduced, the stack has moved up in memory, and program memory space has increased. If you have more than 16K RAM, the space above page 31 has been reserved for machine language programs by the *CLEAR* XXX,&H3FFF command.

Note the words "RANGE IN" at the bottom of the screen. Now, *BREAK*, type in *CLEAR* 10, then *RUN*, select any page, and after the error message LIST line 110 and you will see the string for which there was not enough room.

For our last trick we can demonstrate how an improperly used *GOSUB* can bomb a program. *BREAK* and *CLEAR* 200. Add the following lines:

480 GOSUB 600
600 GOTO 480

RUN, select page 3, select PMODE 4, then hit the "E" key. Wait a few seconds...Here comes the stack. The stack kept building because each execution of the *GOSUB* command added more "temporary" data to it and there was no execution of a RETURN command to unstack any of the data. No harm was done to this particular program, but that is probably an exception. *RUN* and page through memory above the program area. You will see the same data stored over and over for each time the *GOSUB* was executed.

The rest of the snooping is up to you. Examining other programs may be tricky. If a program self-starts, try moving the stack down. Load and run the program you want to examine, then load in PAGER. You may load on top of a part you wanted to see. If so, use the *PCLEAR* command to control where PAGER will load in.

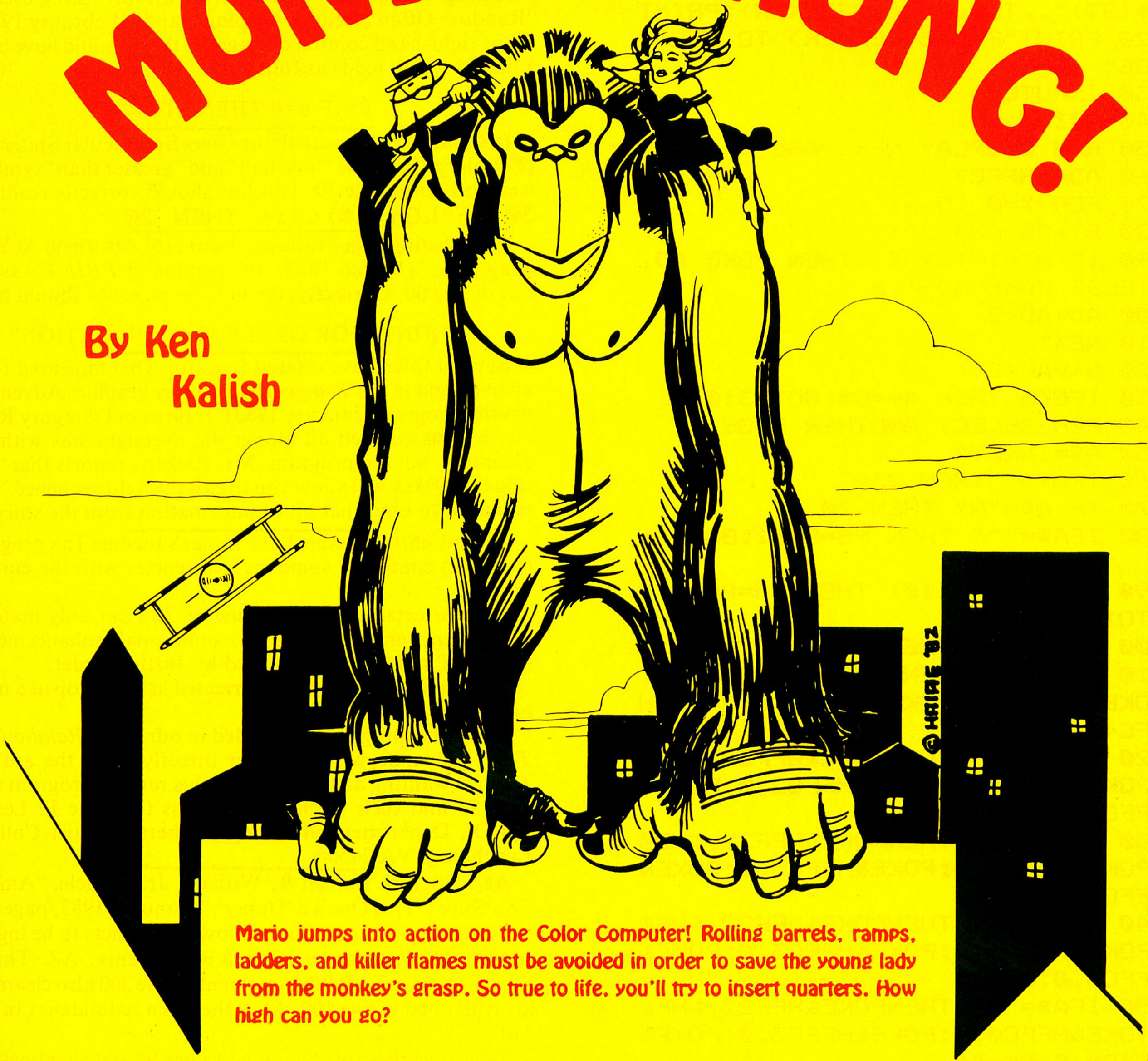
200	0275
END	052B

The listing:

```
10 REM START OF PROGRAM AREA
15 G$="9"
20 CLS:PRINT"ENTER PAGE NUMBER 0
 TO 31"
30 INPUT PG
40 CLS
50 ST=PG*512:EN=ST+511
60 IFG$="0"THEN EN=ST+&H5FF:PRIN
T@160,"PMODE0 PAGE LENGTH=1535 B
YTES":PRINT:PRINT
70 IFG$="1" OR G$="2" THEN EN=ST
```

MONKEY KONG!

By Ken
Kalish



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```
+&HBFF:PRINT@160,"PMODES 1&2 PAG
E LENGTH=3072 BYTES":PRINT:PRINT
80 IFG$="3" OR G$="4" THEN EN=ST
+&H17FF:PRINT@160,"PMODES 3&4 PA
GE LENGTH=6144 BYTES"
90 PRINT"   PAGE  "PG" OF TEXT M
ODE":PRINT
100 PRINT"ADRESS RANGE="ST"..TO.
."EN:PRINT
110 PRINT"RANGE IN HEX=  "+"$"HE
X$(ST)"..TO.."+"$"HEX$(EN):PRINT
120 PRINT"PRESS <ENTER> TO SEE P
AGE"
130 INPUTE$
140 PRINT
150 REM DISPLAY NEW PAGE
160 AD=&HFFC7
170 FOR X=0 TO 6
180 BT=PG AND 2^X
190 IF BT=INT(2^X) THEN POKE AD,
0 ELSE POKE AD-1,0
200 AD=AD+2
210 NEXT
220 G=VAL(G$)
230 IFG<5 THEN A$=G$:GOTO310
240 REM SELECT ANOTHER PAGE
250 A$=INKEY$
260 IFA$=""THEN 250
270 IF A$="N" THEN 20
280 IFA$="^" THEN PG=PG+1:GOTO16
0
290 IFA$=CHR$(10) THEN PG=PG-1:G
OTO160
300 IFA$="#" THEN 40
310 IFA$="0"THENPOKE&HFF22,&HB0:
POKE&HFFC1,0:POKE&HFFC3,0:POKE&H
FFC4,0:G$=A$
320 IFA$="1" THENPOKE&HFF22,&HC0
:POKE&HFFC0,0:POKE&HFFC2,0:POKE&
HFFC5,0:G$=A$
330 IFA$="2" THENPOKE&HFF22,&HD0
:POKE&HFFC1,0:POKE&HFFC5,0:POKE&
HFFC2,0:G$=A$
340 IFA$="3" THENPOKE&HFF22,&HE0
:POKE&HFFC0,0:POKE&HFFC3,0:POKE&
HFFC5,0:G$=A$
350 IFA$="4" THENPOKE&HFF22,&HF0
:POKE&HFFC0,0:POKE&HFFC3,0:POKE&
HFFC5,0:G$=A$
360 IFA$="T" THENPOKE&HFF22,0:PO
KE&HFFC0,0:POKE&HFFC2,0:POKE&HFF
C4,0:G$="9"
370 IFA$<>"E" THEN 250
400 REM  400 LINE AREA FOR INSER
TING EXPERIMENTS
410 SOUND 2,2
500 GOTO250
999 REM END OF PROGRAM AREA...VA
RIABLE AREA FOLLOWS
```

CORRECTIONS

In the listing that follows "Hang Around, You'll Enjoy This" (February 1983), there was an unexpected hang-up. Line 800 had a glitch, or maybe a gremlin, which caused it to throw in some dashes and run into line 810. Correctly, these lines should read:

```
800 FOR I=1 TO KNT:PRINT WRD$(I)
;:NEXT I
810 PRINT: PRINT"              -
RIGHT ? (Y/N)"
```

A program line was omitted from a short listing used in "Random Often Needs A Helping Hand" (February 1983). In the right-hand column on page 14, there should have been a line 55 which reads as follows:

```
55 IF L=0 THEN STOP
```

In the article "Spectaculator Gives Spectacular Statistics" (February 1983), the "less than" and "greater than" symbols were left out of line 30. This line should correctly read:

```
30 IF LEN(A$)<>16 THEN 20
```

In the listing which follows "Power (of Attorney) At Your Fingertips" (March 1983), the command *PRINT* was left out of line 60. Correctly, the line (on page 56) should read:

```
60 PRINT "FOR GENERAL APPLICATION"
```

Several folks have offered fixes for what appeared to be an oversight in our *Dungeon Adventure* graphics Adventure winner program (January 1983). It turns out Gregory Ricketts had us covered all along; the oversight was with *the Rainbow*, not the program. Mr. Ricketts reports that "hitting the 'Q' key will allow you to exit the fight sequence." We managed to omit that bit of information from the story.

In our February issue, Lane Lester's Income Tax program (page 18) contained some inconsistencies with the current form.

The corrected version of *Income Tax* not only matches the current forms but also has some small enhancements, several of which were suggested by Justin Snyder.

For a free print-out of the corrected listing, drop us a note, or call.

While this program is included in our April *Rainbow On Tape*, you may wish to order directly from the author. Anyone wanting a taped copy of this revised program may send $5 and their name and address to: Lane P. Lester, PH.D., Department of Biology, Liberty Baptist College, Lynchburg, VA 24506.

As written in Burton R. Witham, Jr.'s article, "Among The 'Super' This One's a 'Duper'," (January 1983, page 80) the program listing will only allow 10 contacts to be logged reports Melvin Nelson (W8UNB), Phoenix, AZ. This is because the CLEAR 900 statement in line 200 also clears the array defined in line 100. Also, there is a redundancy in line 310.

To correct these problems, add a line 90 and alter lines 200 and 310 as follows:

```
90 CLEAR 900
200 SOUND230,2:CLS:G=136:H=137:N
=0
310 CLS:PRINT@19,"LOG#:";:PRINTU
SING"**####.";X:PRINT@64,"CALL-"
;C$(X):PRINT@78,"TIME-":POKEH,83
:LINEINPUTT$(X):PRINT@96,"FREQ-"
:POKEH,101:LINEINPUTF$(X):PRINT@
107,"NOTES-":POKEH,113:LINEINPUT
N$(X):IFX>1 THEN GOTO330
```

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UTILITY

Dump to Camera: Photographing Your Monitor

By Bruce Rothermel

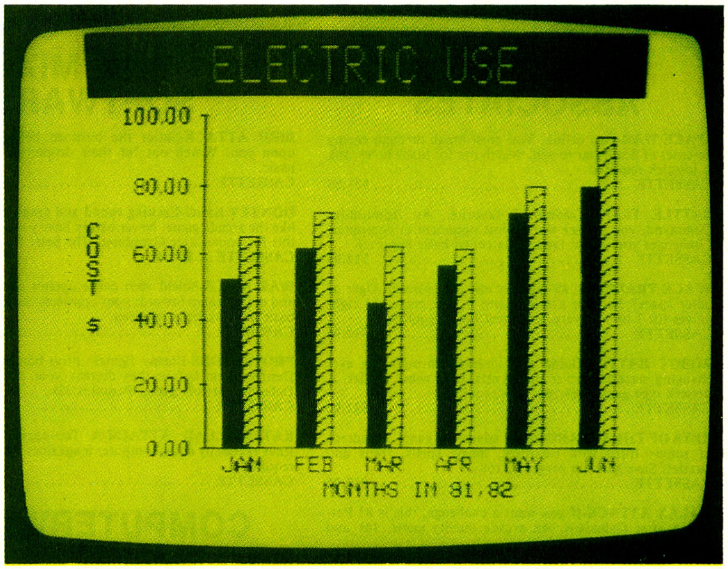

Photo by Bruce Rothermel

You and your Color Computer have just created the world's most interesting graphic on the TV screen. Now what? How do you save it? How do you use it?

One option would be to print the graphic screen on the printer using a screen print program and a graphics printer, but what happened to those breathtaking colors and those crisp fine details? All gone.

Printers are quite limited in their ability to faithfully capture the image as it appeared on the screen and you kiss your colors goodbye. They're not called Color Computers for nothing.

As an alternative, why not photograph your screen? By doing so, you can produce slides or prints of the screen which will capture and retain all the detail and color of the original. Besides, its a lot easier carrying a photo than a 13" TV set.

Here's What You'll Need:

1) A 35mm SLR camera with a "normal" (50 or 55mm) lens. The SLR means single lens reflex—a camera that ensures that what you see thru the viewfinder is what you get on film.

2) A tripod.

3) A cable release if the camera doesn't have a self timer.

Here's How To Do It:

1) Create your masterpiece on the screen.

2) Adjust the color and contrast settings on the TV set to obtain the densest colors available (highest color saturation) without color fringing. You may have to reduce contrast to do so.

3) Mount your camera on the tripod and adjust the height so the camera lens is level with the center of the screen.

4) Move the tripod forward and backward until the screen image is filling the viewfinder frame vertically (up and down). There will be additional space on the sides of the viewfinder since the film frame is wider than the graphics screen, but that's okay.

5) Focus. Since you have a fixed image size, you may end up moving the tripod forwards or backwards a little. With a 13" TV screen, your camera will be about 2.5 ft. away from the screen.

6) Exposure. Now comes the tricky part. Shooting an image from a TV screen is different from taking a snapshot of your girlfriend on a sunny day. First, the light balance is different. Your camera meter wasn't made to be sensitive and accurate to this spectrum. Second, the image on-screen is created by a continuous series of lines (rasters) which because of visual retention look like a solid picture.

The camera has no such memory behind its lens. So, here's what to do:

Set the shutter speed to 1/15 of a second. Any speed faster than 1/30 of a second will catch a raster (don't you like these tech terms) and you will see the scan line.

Turn off the lights and eliminate all sources of glare on the screen. A darkened room is best. Take an exposure reading of the screen. Using ASA 64 film (more about this later) you should have an F-stop of about F/8.

Use a cable release or the self-timer and squeeze off your first exposure. Write down this exposure combination for review later.

7) Bracket your exposures. The trick of the pros is to shoot a lot and throw the bad ones away.

Most of the time, the meter will be misled in making an underexposed picture. So, for the second exposure slow down the shutter one speed to 1/8 of a second to increase the exposure time. Keep the same aperture, or E/stop setting, as the first exposure and shoot again. Record this setting.

Next, slow the shutter one more notch to 1/4 second and shoot again. Record these settings. Just to be sure, go back to the original setting (in this example 1/15 sec. at F/8) and close the lens one stop to F/11. Shoot and record this info. (We bracketed in the other direction—more exposure by opening the aperture to keep the shutter speed slow. Remember those rascal rasters.)

Here's a summary of what happened:
1st exposure — 1/15 sec. @ F/8 base exposure setting
2nd exposure — 1/8 sec. @ F/8 2X 1st exposure
3rd exposure — 1/4 sec. @ F/8 4X 1st exposure
4th exposure — 1/15 sec. @ F/11 1/2 1st exposure

8) Get the film developed and look at the results. Most likely the second exposure will be most pleasing, but whatever looks best will then be your base exposure. From then on you only have to bracket one shutter speed, one F/stop on each side of the base setting.

Remember, always bracket—no matter how good you are. Film is cheap.

9) Speaking of film. Naturally, the type of film you use will depend on the results wanted.

To obtain slides for projection, I would recommend Kodachrome 64 (ASA 64). TV screens tend to photograph blue and Ektachrome and Fuji increase this effect.

For prints, Kodacolor 100 works fine. Plus-X is great for black and white (ASA/ISO 125) and Plus-X negatives can be mounted and projected as a reversed slide. Sort of like a reverse screen print. This is very useful with graphs and charts like those generated by *bar zapper*.

There are many exotic high contrast films available, but start with these basics and experiment.

10) Filtration. If the photographs are still too blue add a filter to the lens. A sky 1A adds a little warmth, an 81A really corrects it.

That's it. The sure fire way to wow 'em with knockout photos generated by you and your 80C.

Hint...

Which Board Do You Have?

We've received a lot of calls and letters, too, asking, "How can I determine what circuit board I have?" These questions come mainly from those contemplating a memory upgrade. A good clue is provided by keying in *EXEC* 41175 which will tell you if you have the 1.0 or 1.1 version of the BASIC ROM chip. If you have a 1.1, says Dennis Lewandowski of DSL Computer Products, then "there's about a 98 percent chance that it's an E board rather than a D or the even newer board," which has a small RF shield housing, often called the F board.

Radio Shack says you have to open up your CoCo to find out for sure, but here at *the Rainbow,* we found that a flashlight and a "peek," using your own two eyes is quite easy. If you will shine a flashlight down into the air vents on the right side (the side on which the ROM port is located) you can see the model number of the board. Look straight down under the first air vent opening (nearest the keyboard). Do you see the green numbers on a black background? Well, the suffix after the hyphen is the board model. You should see a D or an E after the numbers.

Now, if you have a TDP-100, you have the latest board (a.k.a. F board). If you have a fairly new Radio Shack CoCo, take a look inside the ROM port says Ron Krebs of Mark Data Products. Just open it up and peer in. If all you can see is metal, then you have a D or an E board, but if you can see components, then you have the newest board.

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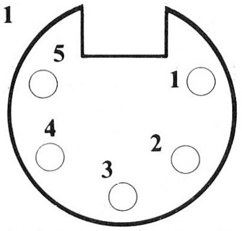
Why Not Build A Light Pen

By Theodore P. Hasenstaub

Ready to shed some new light on your CoCo? An easy to build (and easy on the wallet) light pen is the answer. A simple light pen consists of a photo cell, resistor, and, well, hmmm. . . that's it! We will add a switch, "pot," case, cord and plug. The CoCo has its own D/A (digital to analog) circuitry built right in, so we are ready to go.

Before we start construction, let's take a closer look at what a light pen actually does. A photo cell can be described as an electrical device, which, on being exposed to different intensities of light, changes its amount of resistance, thus changing the voltage that flows through it. Big deal you say? Well, it is, as you will soon see.

Figure 1



JOYSTICK PORT

PIN 1 — X CHANNEL
PIN 2 — Y CHANNEL
PIN 3 — GROUND
PIN 4 — **
PIN 5 — 5VDC

** — is used with fire button, when pressed, it shorts to PIN 3

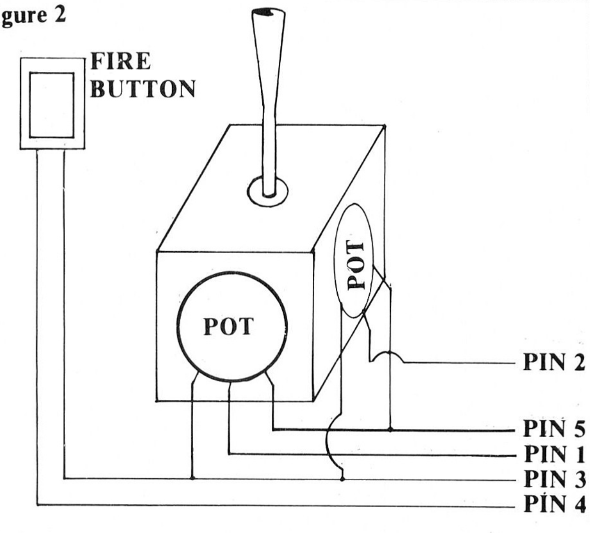
A look at the joysick ports is now in order (Fig. #1). You will see that each port has two input channels. The X channel reads horizontal positions, and the Y channel reads vertical positions (when using joysticks). This is accomplished by using potentiometers. Potentiometers, or pots, are simply variable resisters. In other words, their resistance can by changed by turning the center knobs one way or the other. These two pots are connected together mechanically, so that they both move at the same time. Five volts are applied to one side, and the other side is connected to ground. When the joystick position is changed, it also changes the resistance to the applied voltage (five volts). The center lugs of the pots are connected to the X and Y input channels (Fig. #2). These lines allow the computer to determine joystick positions through its D/A circuitry.

The D/A circuitry consists of an analog switch, or selector, a voltage comparator, and a D/A converter. The selector allows the selection of one of the four input channels (two per joystick port). The voltage comparator then compares two input voltages. One voltage is constant, the other, coming in from the X or Y channel, is not. The D/A converter then approximates the voltage from the channel it is reading. How does this apply to a light pen? Let's build one and see.

First unscrew the white plastic end from the penlight, and remove the bulb and metal contact clip. Now remove the push button switch on the other end. This may be accomplished by pushing it down through the body of the pen with a small piece of rod (be very careful when working with the aluminum body, it is very easy to damage). Next, look into the barrel. Here, you will see a black plastic ring. Push this ring up toward the open end of the barrel. *Gently* break off the inner part of it, so that all that remains is a ring with a hole that is large enough in order to remove the rest of the switch. Use a pair of needle nose pliers to do this. Locate a point about 1½ inches from the open end of the barrel. *Gently* drill a 13/64ths hole at this point.

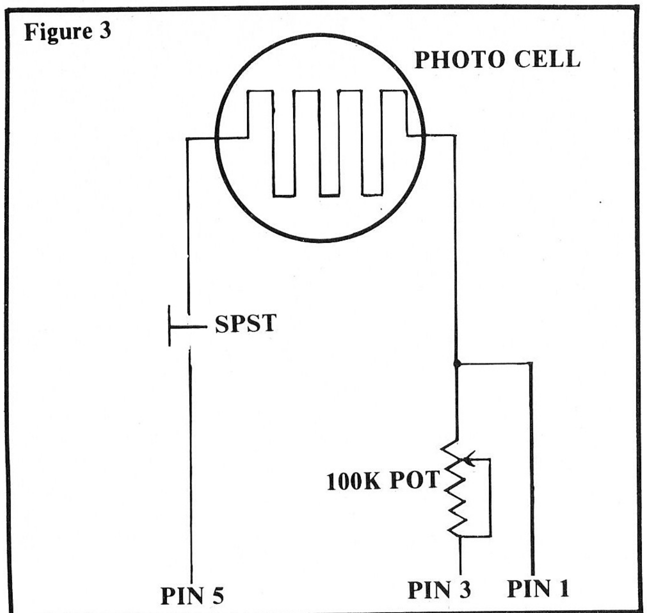
Now we will wire the light (Fig. #3). I've seen the photo cell in two different cases, one is plastic encased (#276-116), the other one is in a metal can (#276-116A). If you use the plastic one, you will have to file its circumference down so that it fits easily into the pen barrel. The metal one drops right in. Pull the two conductor wires up through the pen case and black ring. Strip off about 8 inches of the outer covering. Cut one lead of the photo cell so there is about 1 inch, and trim the other to about 1½ inches. Slide two pieces of shrink tubing over the cable leads. Solder one lead to the 1 inch side of photo cell, and the other to one side of the switch. Slide another piece of shrink tubing over the other photo cell lead. Solder this lead to the other side of the switch. Now slide the shrink tubing up over all the joints and heat it, so all the connections are insulated. Strip off 4 inches of outer covering on the other cable end. Label the wire that you connected to the switch. Now slide the assembly into the pen barrel, and guide the switch so that the button catches into the hole that you have drilled. A little jiggling around and you will be able to get the switch up into the hole. Install the switch lock nut. Screw on the white end piece, and wrap black electrical tape around it, so no white is showing.

Figure 2



Now slide the plug cover onto the cable end and wire as follows. The line that you labeled is soldered to pin #5 of the joystick plug. Cut two pieces of wire about 3 inches long. Label them #1 and #3 and solder them to the corresponding pins on the joystick plug. Assemble the plug and slide the plug cover on. Solder the wire you labeled #3 to the center lug on the pot. Trim the other wire so that the pot lays flat in

Figure 3



the line, then solder it and the wire you marked #1 to one of the outside lugs on the pot. Wrap electrical tape around these connections.

As I said earlier, a photo cell changes its resistance on exposure to different light levels. The CoCo has nine distinct colors that are available. If you expose the light pen to them, you will find that each color will return a different value. By software control you can use these values as variables, and design a program that will use them.

I have included two programs. One allows you to set your own color value tables, and the other will demonstrate the light pen. The demo program uses color values as variables. I designed the program as a quiz. It will display a question and possible answers. A tone will sound, at this point place the tip of the pen firmly against the TV screen, to the color (answer), you choose. Press the button down and hold it down until the next tone. This allows the photo cell to get a true value reading of the color. The program then checks through a comparison routine to check if the answer is right or wrong. This program can be easily modified for any type questions you may want, by simply changing a few lines in the program. I would be very interested in any input from other readers, on other applications, and software, for using this device.

PARTS LIST

Photo Cell	**Radio Shack @376-116 or #276-116A (see text) @ $1.29**
Penlight	**Radio Shack #61-2626 @ $1.99**
Switch	**Radio Shack #275-1571 SPST Normal Open, Momentary**
Joystick Plug	**Spectrum Projects 93-15 86th Place, Woodhaven, N.Y. 11421 @ $4.00**

100K pot, 2 Conductor cable (shielded)

350	032E
650	0701
END	0AC7

Listing 1:

```
10 '  LIGHT PEN DEMO
20 GOTO 660
30 DIM D$(40)
40 RESTORE
50 CLS
60 PRINT@230,"STATE CAPITOL QUIZ
",
70 PRINT:PRINT:PRINT:PRINT
80 INPUT"ENTER YOUR NAME---->";N
$
90 FOR Q=1 TO 1380:NEXT Q
100 FOR N=1 TO 40:READ D$(N):NEX
T N
110 W=0:T=0:JY=JOYSTK(0)
120 N=1
130 CLS(0)
140 PRINT@32, "WHAT IS THE CAPIT
OL OF";" ";D$(N);" ";" ":N=N+1

150 PRINT@161," ";D$(N);" ";:N=N
+1
160 PRINT@257," ";D$(N);" ";:N=N
+1
170 PRINT@353," ";D$(N);" ";
180 FOR V=0 TO 3
190 FOR H=31 TO 37
200 SET(H, 9+V,4):SET(H,15+V,2):
SET(H,21+V,6)
210 NEXT H,V
220 GOSUB 490
230 SOUND 125,5
240 GOSUB 490
250 X=0
260 ' READ COLOR VALUES FROM SCR
EEN
270 FOR B=1 TO 40
```

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```
280 X=X+JY:NEXT B
290 J=JOYSTK(0)
300 ' COMPARE COLOR VALUES
310 IF (N=4) OR (N=12) OR (N=24)
 OR (N=36) THEN GOTO 340
320 IF (N=16) OR (N=20) OR (N=28
) THEN GOTO 350
330 IF (N=8) OR (N=32) OR (N=40)
 THEN GOTO 360
340 IF (J>21) AND (J<38) THEN GO
TO 370 ELSE GOTO 410
350 IF (J>51) AND (J<58) THEN GO
TO 370 ELSE GOTO 410
360 IF (J>40) AND (J<51) THEN GO
TO 370 ELSE GOTO 410
370 SOUND 125,5
380 PRINT@ 450," THAT IS CORRECT
 ";N$;" ";:T=0
390 GOSUB 490
400 N=N+1:IF N>40 THEN GOTO 530
ELSE GOTO 130
410 SOUND 125,5
420 T=T+1:W=W+1
430 PRINT@450," THAT IS INCORREC
T ";N$;" ";
440 IF T=1 THEN W=W-1
450 GOSUB 490
460 IF T=1 THEN N=N-3:GOTO130
470 IF T=2 AND N<40 THEN T=0:N=N
+1:GOTO 130
480 IF T=2 AND N>=40 THEN GOTO 5
30
490 FOR Q=1 TO 1000:NEXT Q
500 RETURN
510 DATA OHIO,COLUMBUS,CLEVELAND
,TOLEDO,KENTUCKY,LOUISVILLE,PROS
PECT,FRANKFORT,TEXAS,AUSTIN,DALL
AS,HOUSTON,ALASKA,FAIRBANKS,JUNE
AU,ANCHORAGE,NEW YORK,NEW YORK,A
LBANY,SYRACUSE
520 DATA MONTANA,HELENA,BILLINGS
,BUTTE, ILLINOIS,CHICAGO,SPRINGF
IELD,PEORIA,KANSAS,KANSAS CITY,W
ICHITA,TOPEKA,MAINE,AUGUSTA,BANG
OR,PORTLAND,MICHIGAN,ANN ARBOR,D
ETROIT,LANSING
530 SC=(10-W)*10
540 FOR Q=1 TO 920:NEXT Q
550 CLS(0)
560 PRINT@226,"YOUR SCORE WAS";"
 ";SC;"%";" ";N$;" ";
570 FOR Q=1 TO 920:NEXT Q
580 PRINT@298," GAME OVER ";
590 FOR Q=1 TO 1000:NEXT Q
600 PRINT@484," PLAY AGAIN? <Y O
R N> ";
610 Q$=INKEY$
620 IF Q$="" THEN GOTO 610
630 IF Q$="Y" THEN GOTO 40
640 IF Q$<>"N" THEN GOTO 610
650 CLS:END
660 CLS
670 PRINT@6,"LIGHT PEN CALIBRATI
ON          ":
680 PRINT"HOLD PEN TIP AGAINST T
HE COLORED";
690 PRINT"BLOCKS ON SCREEN, SLOW
LY ADJUST ";
700 PRINT"THE POTENTIOMETER UNTI
L YOU GET ";
710 PRINT"READINGS THAT CORRESPO
ND TO THE ";
720 PRINT"ONES IN THE TABLE THES
E READINGS";
730 PRINT"ARE NEEDED FOR THIS PR
OGRAM TO  ";
740 PRINT"OPERATE PROPERLY. THE
VARIABLES ";
750 PRINT"IN THIS PROGRAM ARE SE
T TO THESE";
760 PRINT"VALUES. CHECK ALL READ
INGS AFTER";
770 PRINT"EACH ADJUSTMENT IS MAD
E.";
780 PRINT@420," PRESS <C> TO CON
TINUE "
790 Q$=INKEY$:IF Q$="C" THEN GOT
O 800 ELSE GOTO 790
800 CLS(0)
```

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Jungle

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```
810 PRINT@5," RED "; :PRINT@13,"
 YELLOW ";:PRINT@23," CYAN ";
820 FOR V=4 TO 8
830 FOR H=0 TO 6
840 SET(11+H,V,4):SET(29+H,V,2):
SET(47+H,V,6)
850 NEXT H,V
860 PRINT@484," PRESS <D> WHEN D
ONE ";
870 PRINT@245," VALUES ";
880 PRINT@257," READINGS ";
890 PRINT@302," RED    >21 & <38
 ";
900 PRINT@366," YELLOW >51 & <58
";;:PRINT
910 PRINT@430," CYAN   >40 & <51
 ";
920 Q$=INKEY$:IF Q$="D" THEN GOT
O 30
930 X=0
940 FOR Y=1 TO 40
950 X=X+JOYSTK(0)
960 NEXT Y
970 X=X/40
980 PRINT@356,JOYSTK(0);
990 GOTO920
```

Listing 2:

```
DEFINE(LIGHT PEN)


5 ' DEFINE NEW COLOR VALUES
10 CLS(0)
20 FOR V=1 TO 7
30 FOR H=0 TO 8
40 SET(5+H,V,1):SET(19+H,V,2):SE
T(35+H,V,3):SET(49+H,V,4)
50 NEXT H,V
60 FOR V=17 TO23
70 FOR H=0 TO 8
80 SET(5+H,V,5):SET(19+H,V,6):SE
T(35+H,V,7):SET(49+H,V,8)
90 NEXT H,V
100 PRINT@486," PRESS <D> WHEN D
ONE ";
110 Q$=INKEY$
120 IF Q$="D" THEN 200
130 X=0
140 FOR Y=1 TO 40
150 X=X+JOYSTK(0)
160 NEXT Y
170 X=X/40
180 PRINT@206,JOYSTK(0);
190 GOTO 110
200 CLS:END
```

THE STEREO COMPOSER

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The **STEREO COMPOSER** music synthesizer was developed for the true music lover. All the features available for the **COMPOSER** described below are also available for the **STEREO COMPOSER**. However, instead of using the single 6 bit digital to analog converter built into the computer and the speaker built into your TV, the **STEREO COMPOSER** uses two 8 bit digital to analog converters which drive two audio power amplifiers. These amplifiers supply enough audio power to easily drive your own external speakers. If you like, the output may be connected to your home stereo system to further increase fidelity. Connection is provided by two phono connectors. If the music is too loud, two built-in volume controls are provided to allow you to control the volume of each of the channels separately. The advantage of being able to use external high quality speakers is obvious. The use of higher quality digital to analog converters serves to further increase music fidelity.

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Requires Extended BASIC and Minimum of 16K
Specify Cassette or Disk

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THE COMPOSER

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The **COMPOSER** develops a machine language position independent subroutine that can be Saved, Loaded, and Executed independent of all other software. This means that you can share your music with friends. In fact, you can write your own BASIC programs that call and play the music. Software vendors may include the music in their own product.

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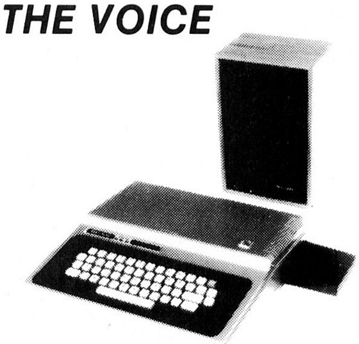

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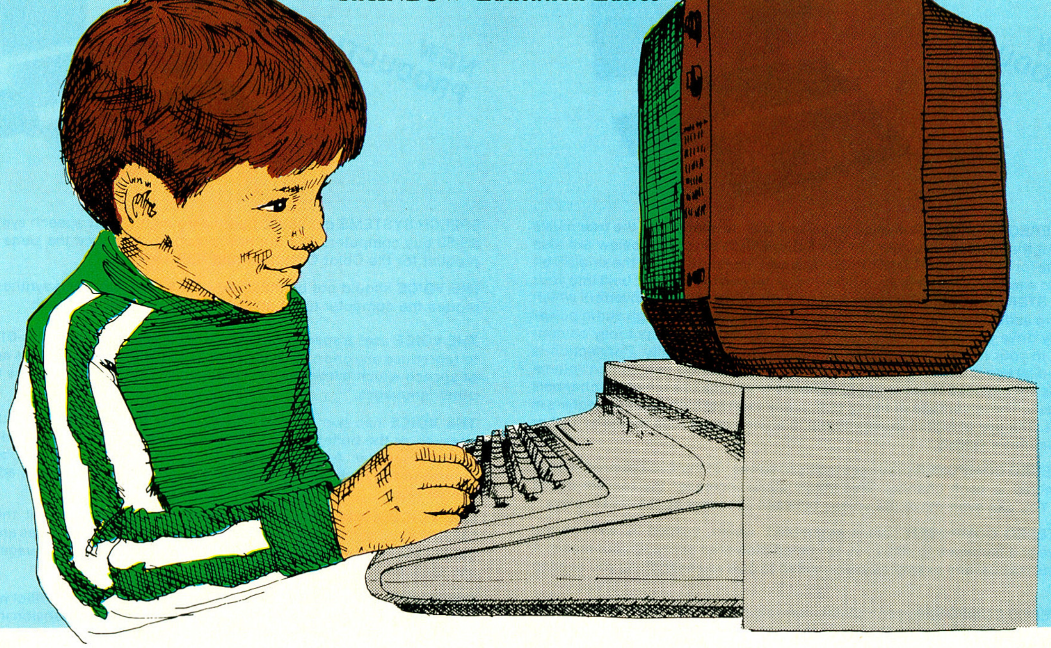
EDUCATION NOTES

4K

Exercise Your Strings With This Vowel Checker

By Steve Blyn
***RAINBOW* Education Editor**



This month we will investigate further how string manipulations can help to build language based programs. Strings are usually words, and words are the building blocks of language. Many Language Arts and Foreign Language programs can be developed after a basic knowledge of string manipulation is obtained. It has often been stated that "without string handling capabilities, a computer is just a super calculator." Although exaggerated, there is a lot of truth in that statement.

All strings have a left side, a middle, a right side and a length. We can thus examine all portions of the string using the string functions—LEFT$, MID$, RIGHT$, and LEN. If we set A$ equal to the word computer, then:

LEN A$ would be equal to 8
LEFT$(A$,1) would = "C"
RIGHT$(A$,1) would = "R"
LEFT$(A$,3) would = "COM"
RIGHT$(A$,2) would = "ER."

Let's check this out on your computer.

```
10 CLS
20 A$="COMPUTER"
30 PRINT LEN(A$)
40 PRINT LEFT$(A$,1)
50 PRINT RIGHT$(A$,1)
60 PRINT LEFT$(A$,3)
70 PRINT RIGHT$(A$,2)
80 LIST
RUN
```

MID$ is even more impressive. It can check any portion of the string.

MID$(A$4,2) would = "PU." The 4 tells the computer to begin at the fourth letter and the 2 tells how many letters to include.

MID$(A$2,3) would = "OMP." Print MID$(A$,2,3) to check this out. Try checking out some of your own combinations before going on.

The computer can build up or break down strings in any fashion we choose. Let's build up the words COLOR COMPUTER adding one letter at a time.

```
10 CLS
20 A$="COLOR-COMPUTER"
30 FOR T=0 TO LEN(A$)
40 PRINT LEFT$(A$,T)
70 NEXT T
RUN.
```

As the (T) value is increased by 1 in lines 30 and 70, the next letter in the word gets added on until the whole word is built up to its entire length...LEN (A$)

The computer can also check out and act on each letter as it is going through the list. Let's have it check for any letter "O"s. To accomplish this, we will add lines 50 and 60 to the above program.

```
50 B$=LEFT$(A$,T)
60 IF RIGHT$(B$,1) = "O" THEN SOUND 220,3
```

RUN the program once again.

Line 50 checks our progress on the string construction leftwards, and line 60 makes a sound if an "O" is the rightmost letter at that time. Thus, every time an "O" is found at the right end of the word as it is being built up, a sound is made.

If the letter "O" can be checked, then so can any other characters. The program that follows is a vowel counter. The child may *INPUT* any word, phrase, or sentence that he wishes. He is asked to count the number of vowels. The program checks for the vowels A, E, I, O, and U.

The Y is more difficult to check because there are quite a few cases where Y is or is not used as a vowel. We chose to include only one instance when Y could be a vowel—if it is at the end of a word and it is not preceded by a vowel, then Y is counted as a vowel. This is done on line 0. An example would be FLY. Trying to work out additional times when Y is counted as a vowel, (such as when there are no other vowels in the word), is excellent practice in exercising your string muscles.

By slightly altering the methods outlined here, many other Language Arts and Foreign Language exercises can be developed. By using LEFT$(A$,2) or LEFT$(A$,3), prefixes or foreign language articles can be checked. Using RIGHT$(A$,2) or RIGHT$(A$,3) can check for suffixes, endings, or plurals. The MID$ function could permit checking for root words or particular letters as was done in this article.

190	0211
END	0466

The listing:

```
10 REM "VOWEL COUNTER"
20 REM "STEVE BLYN-COMPUTER ISLA
ND
30 CLS
40 PRINT"WHAT IS YOUR NAME";:INP
UT NA$
50 N$=LEFT$(NA$,12)
60 X=0:T=0:M=0:H=0
70 CLS
80 PRINT"TYPE IN ANY WORD ";N$
90 PRINT:INPUT A$
100 REM"*** BREAK THE WORD UP IN
TO SUCCESSIVELY LONGER PORTIONS"
110 FOR T= 1 TO LEN(A$)
120 H=H+1
130 B$=LEFT$(A$,H)
140 REM"***    CHECK FOR VOWELS-
A,E,I,O,U"
150 IF RIGHT$(B$,1)="A" OR RIGHT
$(B$,1)="E" OR RIGHT$(B$,1)="I"
OR RIGHT$(B$,1)="O" OR RIGHT$(B$
,1)="U" THEN X=X+1:GOSUB 380
160 NEXT
170 REM"CHECK FOR THE NEXT TO LA
ST LETTER IF THE LAST LETTER IS
A "Y"
180 L=LEN(A$)-1
190 IF L<1 THEN 220
200 L$=MID$(A$,L,1)
210 IF RIGHT$(A$,1)="Y" AND L$<>
"A" AND L$<>"E" AND L$<>"I" AND
L$<>"O" AND L$<>"U" THEN X=X+1:G
OSUB 380
220 PRINT
230 PRINT"TYPE THE NUMBER OF VOW
ELS IN THE WORD ";A$;" ";N$;:INP
UT Y
240 PRINT:IF Y=X THEN SOUND180,1
:SOUND200,1:PRINT"CORRECT ";N$:G
OTO 360
250 REM"*********LET'S KEEP OUR
GRAMMAR STRAIGHT HERE"
260 PRINT
270 PRINT"        SORRY, ";N$
280 SOUND20,4:SOUND10,4
290 IF X=1 THEN PRINT"THERE IS";
300 IF X<>1 THEN PRINT"THERE ARE
";
310 PRINTX;"VOWEL";:IF X<>1 THEN
 PRINT"S";
320 PRINT" IN THE ":PRINT"WORD -
";A$
330 IF X=0THEN 360
340 IF X=1 THEN PRINT"IT IS   - "
V$(1):GOTO360
350 PRINT"THEY ARE  ";:FORM=1TOX
:PRINTV$(M);" , ";:NEXT
360 PRINT@448,"PRESS <ENTER> TO
GO ON";:INPUT EN$
370 GOTO 60
380 V$(X)=RIGHT$(B$,1):RETURN
```

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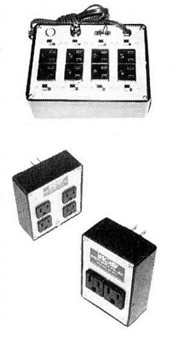

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ASSEMBLY CORNER

Write An ML Program To Handle BASIC Chores

By

D.S. Lewandowski

Rainbow Contributing Editor

First of all, we should establish that programming in assembly language is *not* the same as machine language. In assembly language we use an Editor/Assembler to enter our program into a text buffer. Once finished the Assembler will transform our text into a machine language program. Learning assembly language has nothing to do with the amount of skill you can demonstrate in BASIC programming, or any other computer language. The finished product, a machine language program, will be as short, or as long, as necessary to accomplish a task you have set for the computer to perform. There is no magic, or mystery to programming in any computer language. Mostly, practice will make you proficient with assembly language. It really boils down to a logical thought process. Just take your programming idea, and break it into sub-tasks (or bite-size pieces, if you prefer). Tackle each sub-task one at a time. Sometimes a sub-task will be a bit too much so, again, break this sub-task into further sub-tasks. On the other hand, you may solve two, or more, sub-tasks with one solution.

Starting this month, our task is going to be: Write a machine language program which will perform the same task as a BASIC program. So, here is the first BASIC listing:

Listing 1:

```
10 CLS
20 I$=INKEY$ : IF I$="" THEN 20
30 I=VAL(I$) : IF I<0 THEN I=0
40 IF I>8 THEN I=0
50 CLS(I) : GOTO20
```

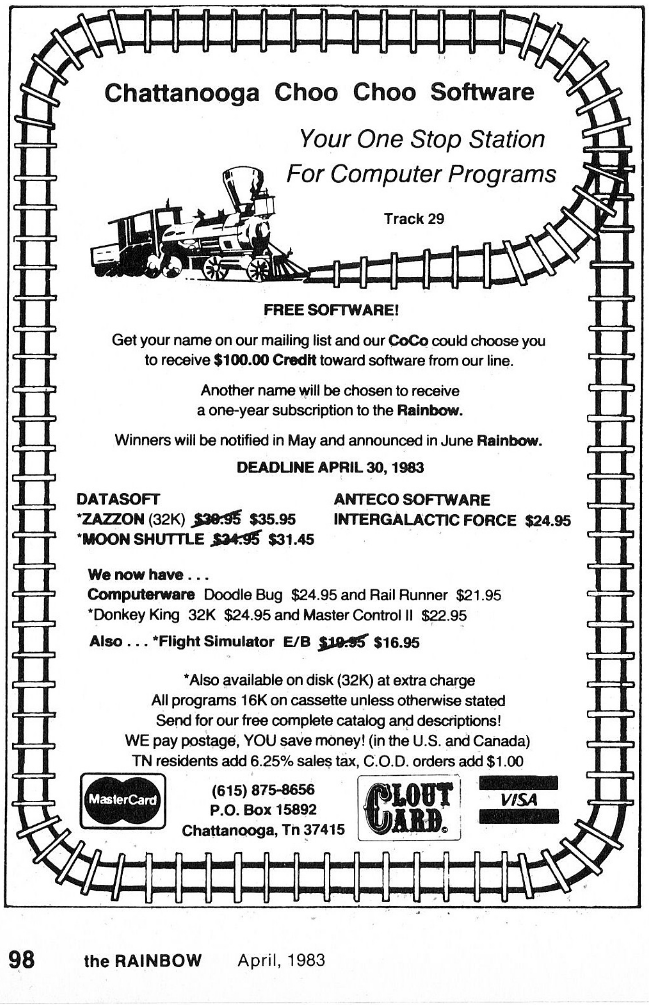
What will this program do? Line 10 will clear the screen to the color green. Line 20 will scan the keyboard, and wait until a key is pressed. Once a key has been pressed, Line 30 will take the value of the string variable and convert it into a numeric variable (I). Line 30 will also check to see if the value of I is less than zero. Line 40 checks the upper limit of the CLS command, it checks for a value greater than eight. In both cases, if I is less than zero, or I is greater than eight, I is set to zero. Line 50 clears the screen to the color value of I, then restarts the routine by going to Line 20.

Okay, what we need to do is see what we need. We need to clear the screen. We need to get a keypress from the keyboard. We have to check the keypress and see if it falls into the range of zero and eight. Finally, we need to clear the screen to the color value of a valid keypress, or clear it to zero in all other cases. That seems enough sub-tasks. To solve the first one, let's remember that BASIC has a clear screen routine. The address of this routine is $A928; this information is available from sources such as *the Rainbow*. Let's pause a moment and dissassemble this routine, I will provide the comments.

```
A928/  LDB   #$60     Load the B register with $60
A92A/  LDX   #$400    Load X with screen start
A92D/  STX   <$88     Update cursor position
A92F/  STB   ,X+      Store the value in B at the
                      location X is pointing at and
                      increment X by one
A931/  CMPX  #$5FF    Check for last screen byte
A934/  BLS   $A92F    Loop to STB ,X+ until done
A936/  RTS            Return from routine
```

Well, this provides us with a simple method of clearing the screen. Also, if we load B with the correct value, we can simply jump to the routine at $A92A, to put the value in B on the screen. That's pretty handy.

How about getting a keypress? Another ROM routine? Sure, why not? The routine which most resembles the *INKEY* command of BASIC is located at $A1C1. This routine will return the value of the keypress in the A register. The value of the keypress is in ASCII. On an ASCII conversion chart, zero to eight are represented as $30 to $38. If we subtract $30 in each case, we will end up with the correct values we need for this task. Hmmm, the graphic blocks which correspond to the color values are: CLS(0) = $80,



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```
10 PRINT"EXAMPLE": FORX=ATO M:FORY=STO
P:Z=X + Y:PRINTZ:NEXTY:NEXTX
```

Into this: –

```
10 PRINT "EXAMPLE":
        FOR X = A TO M:
              FOR Y = S TO P:
                    Z = X + Y:
                    PRINT Z:
              NEXT Y:
        NEXT X
```

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Except for CLS(0) all the graphic blocks are separated by $7F. But the values from one to eight will be too small; we need values ranging from $10 to $80, to make this work. What we have to do is shift the values four places, which will effectively multiply the values within by $10. Okay, I think we're ready to program. In Listing 2, you will have the program which will operate the same as the BASIC program in Listing 1.

Listing 2:

```
0E00                  00100          ORG    $E00
0E00  BD    A928      00110  START   JSR    $A928
0E03  BD    A1C1      00120  WAIT    JSR    $A1C1
0E06  27    FB        00130          BEQ    WAIT
0E08  81    31        00140          CMPA   #$31
0E0A  25    10        00150          BLO    ZERO
0E0C  81    38        00160          CMPA   #$38
0E0E  2E    0C        00170          BGT    ZERO
0E10  80    30        00180          SUBA   #$30
0E12  48              00190          LSLA
0E13  48              00200          LSLA
0E14  48              00210          LSLA
0E15  48              00220          LSLA
0E16  8B    7F        00230          ADDA   #$7F
0E18  1F    89        00240          TFR    A,B
0E1A  20    02        00250          BRA    CLS
0E1C  C6    80        00260  ZERO    LDB    #$80
0E1E  BD    A92A      00270  CLS     JSR    $A92A
0E21  20    E0        00280          BRA    WAIT
            0E00      00290          END    START
```

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Software Review . . .

64K Hits The Market With This Word Pro '*Plus*'

To sum a review in one sentence, it appears that the CoCo has finally come of age. The *64K Screen Expander* by Computerware is a cassette based program that requires a 64K color computer with Extended BASIC. A *CLOADM* command followed by an *EXEC* gives you a full 51 characters across, 24 lines, upper and lower case screen. The program to enable the 64K option is built-in and is automatic. What if you hit the reset button? No sweat. The program is protected against reset. It works too! What about the *PRINT@* statement? No problem.

Actually the 51 x 24 screen is only part of the package. Another program supplied is a "Character Set Editor" on the reverse side of the tape. Written in BASIC the "CHRGEN" gives you the opportunity to design your own custom character sets. After a *CLOAD* and *RUN* you are treated to the entire character set on the top half of the screen. The bottom half of the screen has a menu of commands and a 5 x 8 array of dots. After selecting the character you wish to alter you can either use the joystick or arrow keys/spacebar to design your own. After each character, you have the choice of whether to quit or continue, or save the set to either tape or disk. The custom character set then may be used at any time by a *CLOAD* command after running the *Screen Expander.*

Now, back to the main package. Even though it is not specified, the program resides in high ($F800) memory. I think it would have been nice of the authors to tell us exactly where so as to prevent any wipeouts, even though it's pretty unlikely at that location. Also, no mention is made of whether the program is relocatable. At the same time, user options are as follows:

HI-RES SWITCH — Regular or hi-res screen.
DISPLAY MODE — Normal or inverted characters.
PRINT@MODE — Modify syntax of PRINT@ statement.
CHARACTER SET POINTER — Start of lookup table.
COPY TEXT TO GRAPHIC — Copy the hi-res text screen to the current graphics page.
COPY GRAPHIC TO TEXT - Copy current graphic pages to hi res text screen.
SETUP PAGE 0 AS PMODE 4 — Simulate PMODE 4, 0

The last three subroutines allow the combination of graphics and text on a high resolution screen.

In summary, I recommend this program to anyone as an excellent utility for whatever use you have in mind. The program seems to be problem free and immune to my standard accidental "wipeout" procedures. To move the program to disk, you may try a *SAVEM*"R64K51C",&H4000,&H48FF, &H4000. It seems to work just fine.

(Computerware, P.O. Box 68, Encinitas, CA 92024, $24.95 tape, $29.95 disk)

—Dan Downard

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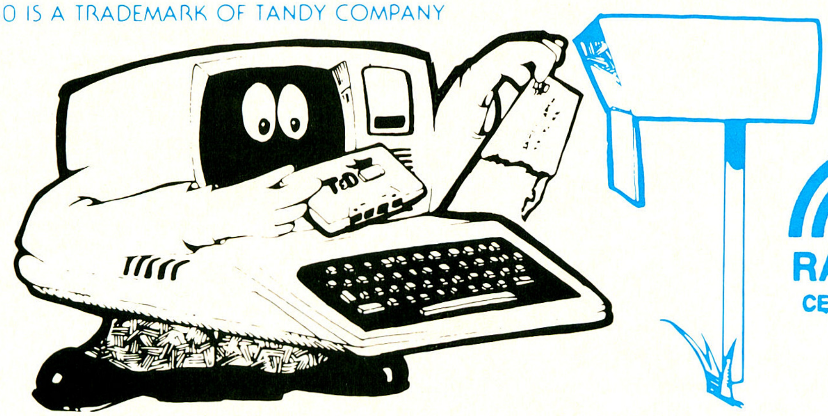

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Software Review . . .

Protectors Called Outstanding Arcade Game

Video games are really hot these days. To get a shot at your favorite game, you will normally have to wait your turn in the arcade, and as soon as you are killed, it costs you another quarter to play again. With the difficulty and complexity of today's games, you can very quickly spend your entire allowance for the week in a matter of minutes. Fortunately, our CoCo is, among other things, a great game playing machine, and the major software firms have seen fit to translate our favorite games into a language that CoCo can understand.

Protectors is a 32K machine language game which is patterned after the popular *Defender*. For those of you who are not familiar with the game, the object is to defend your city from the waves of enemy fighters who are constantly dropping bombs on it. In order to do this, you must zap the enemy fighters with your laser cannon before they drop their bombs. If you can't manage to do that, you can still zap the bombs before they hit your city. Of course, the enemy fighter planes are not your only problem. There are heat seeking mines, a mother ship that zeros in on you, and a sort of mini-ship that you can barely see but you can hear. You also have four "smart" bombs per ship and there are three skill levels that you can choose from. There is also a pause feature, and you get a new ship with each 5,000 points.

After you load the program and *EXEC* it, one of your ships appears in the upper left hand corner of the screen, and begins firing to the right and moving down. As it does, the title screen begins to appear. After you select the skill level you want, the action begins.

At first, the action is slow and there are not too many enemy fighters or heat-seeking mines. As you complete each "attack wave," the action speeds up and there are more enemy fighters to contend with. At the same time, the heat seeking mines become more difficult to avoid, and the mini-ships and mother ship begin to harass you. At about attack wave 10, the screen is really becoming full, and some of the enemy fighters are turning into kamikaze fighters. Around attack wave 15, it is almost impossible to stay alive. There are enemy fighters, heat seeking mines, and the like all over the place, and everything is moving about with amazing speed. Eventually, you are killed off, and you get the chance to give your joystick button and your fingers a well deserved rest. So far, my best score is just under 95,000, and believe me, you will need a rest after scoring that many points.

Protectors has outstanding graphics and sounds, and the attention to detail is truly amazing. One of the things I liked most about it, though, was that I was able to out-score my brother, Steve, who can regularly double or triple my best scores on all the other games that we have played. *Protectors* is one of the finest games that I have ever seen, and it is a must for all of you arcade game fans out there. Even if you don't like games, you should buy it just to see what CoCo is capable of doing in the hands of a master programmer.

(Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, $24.95 tape, $27.95 disk)

—Gerry Schechter

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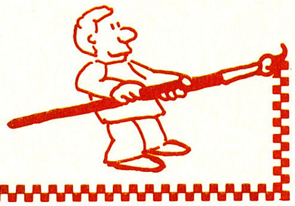
Paint An ASCII Border 'Round The Ol' CoCo

By Ray Gauvreau



Have you got the green screen blues? Want to liven up your title pages? Impress your friends? The following is a short program designed to place a character border around the alphanumeric display screen. This position independent code is very short and very fast and will 'paint' the edges with any printable ASCII character, either graphic or alphanumeric, reverse field or normal.

The routine can be created by running the BASIC program which *POKES* the routine into high memory. Once created, the code can be saved by typing in *CSAVEM*"BORDER",16352,16380,16352. You can append the BASIC lines 10 through 70 to your own basic programs. Once in memory the routine is called by the basic command X=USR0(Y). In this form X can be any value because it is not used, and Y is set to the ASCII value of the character you wish to frame with.

I'll explain some of the BASIC program. Line 10 clears some string space and then protects high memory beginning at 16325. This is where the code is to begin. Line 20 reads the values stored in the *DATA* statements 50 to 70 and *POKES* these values one at a time into memory. Line 30 tells the computer where to go when it encounters the USR0 command, such as the one used on line 160. The rest of this program sets up and calls the routine. First you are asked to *INPUT* a number, then this is checked to see if it is greater than 32767 as this is the largest value the routine can handle. Lines 120 and 140 each call the subroutine with a different value inside the brackets. The USR0 values don't always correspond to the ASCII you would expect. Play with it.

The listing:

```
10 CLEAR200,16352
20 FOR R=16352 TO 16380:READ P:P
OKE R,P:NEXT R
30 DEFUSR0=16352
40 'THESE DATA STATEMENTS HOLD
    THE MACHINE LANGUAGE ROUTINE

50 DATA 189, 179, 237, 31, 152,
142, 4, 0, 16, 142
60 DATA 4, 31, 237, 137, 1, 224,
 237, 164, 49, 168
70 DATA 32, 237, 129, 140, 4, 32
, 38, 240, 57

80 'TO SAVE THE ROUTINE TYPE
CSAVEM"BORDER",16352,16380,16352
90 'THE REST OF THIS PROGRAM IS
    DEMONSTRATION

100 CLS : INPUT "INPUT THE ASCII
 NUMBER FOR THE  BORDER YOU WANT
 ";BN
110 IF BN>32767 THEN GOTO 100CLS
120 CLS RND(8) :X=USR0(BN)
130 PRINT@168,"IT'S SHOW TIME";
140 X=USR0(BN )
150 FOR R=1 TO I:NEXT
160 X=USR0(BN-3)
170 FOR T=1 TO I:NEXT
180 IF I>1 THEN I=I-1 ELSE I=50
190 IF INKEY$=""THEN140
200 GOTO 100
```

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Software Review . . .

Kzirgla Has Good Graphics, Sound, But Lacks Diversity

Adventure games are the best thing for microcomputers since *Space Invaders*. They require skill, luck, curiosity, and patience. I have played enough Adventures to know that skill and curiosity are a necessity. On the whole I play text Adventures. But it is my real dream to play graphics Adventures with hundreds of rooms and zillions of treasures. Well, if you are thinking of buying *Conquest of Kzirgla* for treasure hunting you can forget that idea right now!

Conquest of Kzirgla is a 16K Adventure game made by Rainbow Connection Software. You load the game by doing a *CLOADM*; then, suddenly, a graphics display materializes while the game is loading. That is very impressive. Once loaded, it asks you if the hit point values and strength values are to your liking. Usually they are, but it is better to have high hit points, in my opinion. Throughout the game the text words are expressed in an ersatz Old English. That is a nice touch!

After you answer "yes" or "no," you enter the high resolution graphics screen. Here you see a maze being drawn remarkably fast. I was extremely impressed by the way the mazes were constructed and drawn. When the entire maze is drawn, two little figures are put on the screen: your character and the wizard. By the way, your goal is to destroy this wizard by any means possible. Unfortunately, if you get too close to him in the beginning it is automatic suicide! Not only do you have to kill *him*, but you have to do battle with his henchmen.

There are six creatures who have only one goal in mind. That goal is to destroy you in any way possible. The creatures' names are very unusual. The six names are Cellapod, Centapor, Mantoid, Jartrex, Cadaver and Tantrite. Each monster has its own strengths and weaknesses. As you go deeper into the mazes more creatures appear. I have made it all the way into level 10 and have seen the next to last creature, Cadaver.

The nice thing about this game is that your character moves very fast and has a nice shape. Some games make your character look like a dot or a square. You are capable of firing fireballs or deathrays. Also, you obtain weapons such as clubs and daggers as the game goes on. The only catch is that for every fireball, deathray or shield used, you use so much energy. The numbers and letters at the bottom of the screen flow very smoothly and have a nice look about them.

The instruction manual that comes with the game is very informative. It explains your goal and describes the monsters. I would hate to meet any of them in a dark alley! (Or *anywhere* besides my CoCo screen, for that matter.) Also, it gives you a list of commands and what they do.

This is a well-constructed Adventure game, but I must say this: though at first, the adventure is fun and interesting, it soon becomes monotonous. All you do is kill. There are no treasures to find or special spells to cast. By the time I got to level 10, the boredom had overtaken me.

The next time Rainbow Connection Software makes a maze Adventure they should think about putting treasures and spells in the game. Also, it would have been nice if they had a game save feature in the program. If you are interested in purchasing a game for great graphics and fantastic sound, this is the game for you. On the other hand, if you want to buy a game to search for treasures and use your mind this is not the one.

(Rainbow Connection Software, 3514 6th Place N.W., Rochester, MN 55901, $21.95 cassette, $26.95 disk)

—Ken Ostrer

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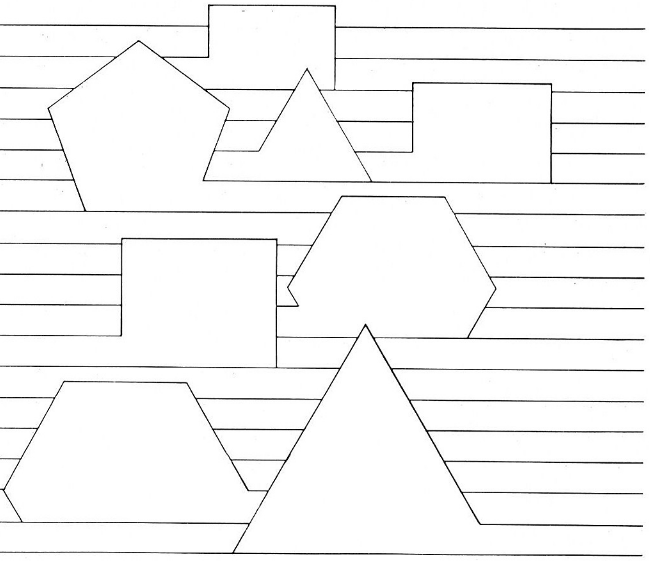


By Don Inman

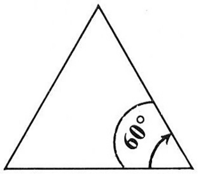
***Rainbow* Contributing Editor**

This is the seventh of a series of articles on the graphic capabilities of Extended Color BASIC on the TRS-80 Color Computer. It goes beyond the material that was covered in the book *TRS-80 Color Computer Graphics.* The material is copyrighted by Don Inman.

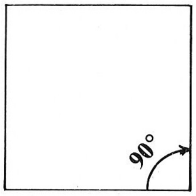
"A polygon is a plane figure consisting of n points, p_1, p_2, p_3, ... , p_n, called vertices, and of n line segments p_1p_2, p_2p_3, ... , p_{n-1} p_n, p_np_1 called sides. A polygon of three sides is a triangle; of four sides is a quadrilateral, or five sides is a pentagon, ... , of n sides is an n-gon." (From *Mathematics Dictionary* by James and James; D. Van Nostrand Company, Inc.)

In this article, we will restrict our discussion to regular polygons. A polygon is regular if its sides are equal and its interior angles are equal.

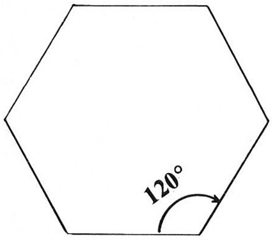
Examples:



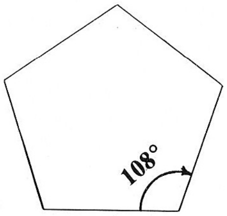
Triangle
n = 3



Quatrilateral
n = 4

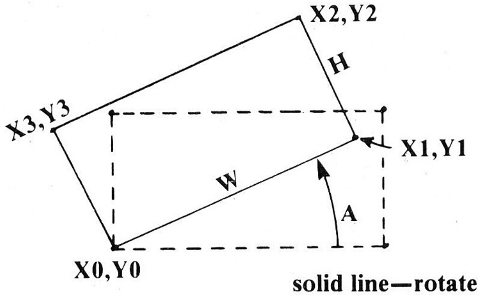


Hexagon
n = 6



Pentagon
n = 5

In last month's article, a general program was developed which drew a rectangle when given its height (H), and width (W) and the coordinates of one vertex (corner), XO,YO. It was discovered that the rectangle could be rotated by using the sine and cosine functions to draw the lines at an angle to the horizontal or vertical axes.

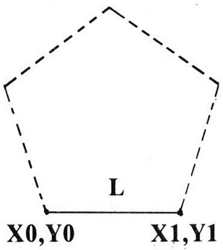


solid line—rotated rectangle
dotted line—original rectangle

1) X1 = X0 + COS(A) * L
   Y1 = Y0 — SIN(A) * L
2) X2 = X1 — SIN(A) * H
   Y2 = Y1 — COS(A) * H
3) X3 = X2 — COS(A) * L
   Y3 = Y2 + SIN(A) * L

Since all sides of a regular polygon are equal, it would seem that a similar, but simpler, technique could be developed for regular polygons. Let's first examine a specific case, the regular pentagon.

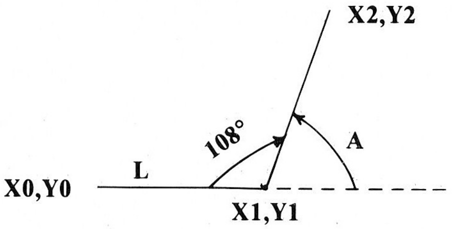
Starting at the lower left corner X0,Y0, draw a line of length L with no rotation (A = 0) to the pont X1,Y1.



It is clear that X1 = X0+L and Y1 = Y0. But, since the cosine of zero degrees equals 1 and the sine of zero degrees equals 0, the relationships could have been stated as:

X1 = X0 + COS(0) * L and Y1 = Y0 + SIN(0) * L

Next, consider the angle A between the extended line from X0,Y0 through X1,Y1 and the line segment from X1,Y1 to X2,Y2.

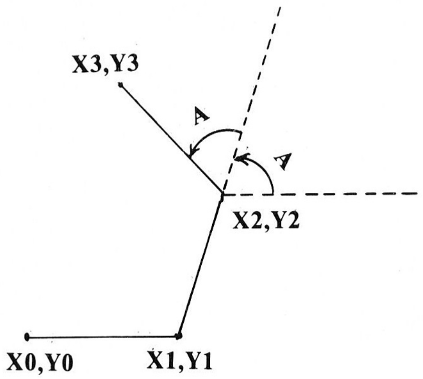


Angle A = 180 - 108 = 72 degrees

Angle A, as shown in the diagram is called an external angle. From what was learned about rotated rectangles last month, the coordinates of X2,Y2 can be stated as:

X2 = X1 + COS(72) * L and Y2 = Y1 + SIN(72) * L

Turning the next corner through Angle A, we have the line segment from X2,Y2 to X3,Y3. The angle of rotation as measured from the horizontal is now A + A = 144 degrees.



At this point, I would like to make the conjecture that the coordinates for the point X3,Y3 can be stated as:

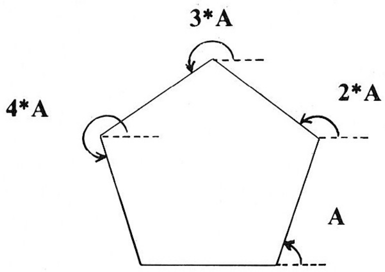
X3 = X2 + COS(11) * L and Y3 = Y2 + SIN(144) * L

Proceding through point X4,Y4 and back to X0,Y0, this conjecture would lead to general equations for any coordinate pair that describes a vertex of the pentagon.

Given X0,Y0 with N>1,

$X_n = X_{n-1} + COS((n-1)*A) * L$

$Y_n = Y_{n-1} + SIN((n-1)*A) * L$

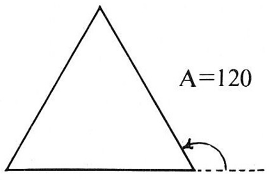


If this is true, a regular pentagon can be drawn by the computer using a BASIC program with two known variables:

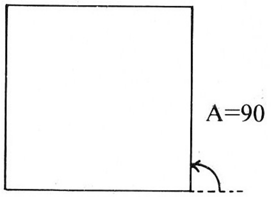
L = length of the equal sides

X0,Y0 = coordinates of one vertex

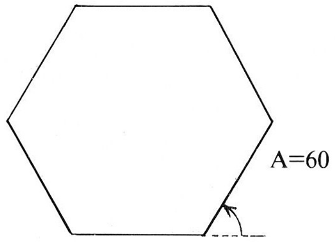
Now look at the size of the external angles of the following regular polygons.



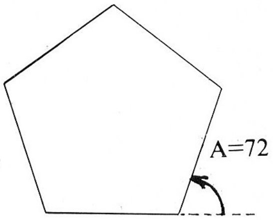
n = 3
n*A = 360



n = 4
n*A = 360



n = 6
n*A = 360



n = 5
n*A = 360

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It appears that the sum of the external angles of any regular polygon is 360 degrees. Another way to state this is that if you know the number of sides (N) of a regular polygon, an external angle can be found by:

$$A = 360/N$$

If this is true, any regular polygon can be drawn by a computer using a BASIC program with three known variables:

N = number of sides
L = length of one side
X0,Y0 = the coordinates of one vertex

Keeping in mind that the angles for trigonometric functions must be stated in radians for the BASIC program and that 2π radians = 360 degrees, a single FOR-NEXT loop can be set up to do all the work.

First define some variables:

N = number of sides
A = angle in radians
S = $2\pi/N$ the step for the loop
P = $2\pi - S$ the exit limit of the loop

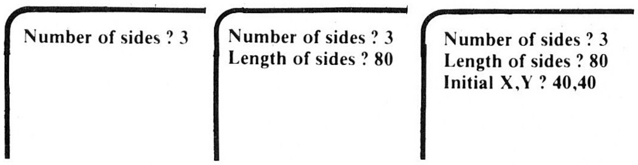
With X1 = X0 and Y1 = Y0 as the loop is entered, the FOR-NEXT loop becomes:

```
FOR A = 0 TO P STEP S          negative to convert dis-
 X2 = X1 + COS(A) * L          play to Cortesian coor-
                               dinates
 Y2 = Y1 - SIN(A) * L * .8 <-- adjustment for screen
 LINE(X1,Y1)-(X2,Y2),PSET      distortion
 X1 = X2: Y1 = Y2 <----------- end point of one line
NEXT A                         becomes start of next
```

The following program was written so that the pentagon drawing portion is a subroutine. In this way, it can be added to any program that you wish. The main program is written in three function modules.

1. Input

This module clears the text screen and then requests the inputs N, L, and X0,Y0 in succession.



```
Number of sides ? 3
```

```
Number of sides ? 3
Length of sides ? 80
```

```
Number of sides ? 3
Length of sides ? 80
Initial X,Y ? 40,40
```

2. Screen Set-up

This module sets the graphics screen to two-color, high resolution and sets the colors to provide black lines on a green background.

3. Program Control

This module inverts the Y axis so that the first quadrant of the Cartesian Coordinate System is displayed. It also allows for a correction factor of 0.8 to the Y axis. The drawing subroutine is called, and upon return, INKEY$ is used to hold the graphics screen until a key is pressed. At that point, a return is made to the first module.

The subroutine uses the FOR-NEXT loop, described previously, to draw the desired polygon.

END 01C4

Listing for Regular Polygons

```
100 REM *** INPUT ***
110 CLS
120 INPUT"NUMBER OF SIDES";N
130 INPUT"LENGTH OF SIDES";L
140 INPUT"INITIAL X,Y";X1,Y1
150 '
200 REM *** SCREEN SET UP ***
210 PMODE 4,1
220 PCLS1
230 COLOR 0,1
240 SCREEN 1,0
250 '
300 REM *** PROGRAM CONTROL ***
310 Y1=181-.8*Y1
320 GOSUB 5000
330 IF INKEY$="" THEN 330 ELSE 1
10
340 END
350 '
5000 REM *** POLYDRAWSUB ***
5010 S=6.2832/N
5020 P=6.2832-S+.01
5030 FOR A = 0 TO P STEP S
5040 X2=X1+COS(A)*L
5050 Y2=Y1-SIN(A)*.8*L
5060 LINE(X1,Y1)-(X2,Y2),PSET
5070 X1=X2: Y1=Y2
5080 NEXT A
5090 RETURN
```

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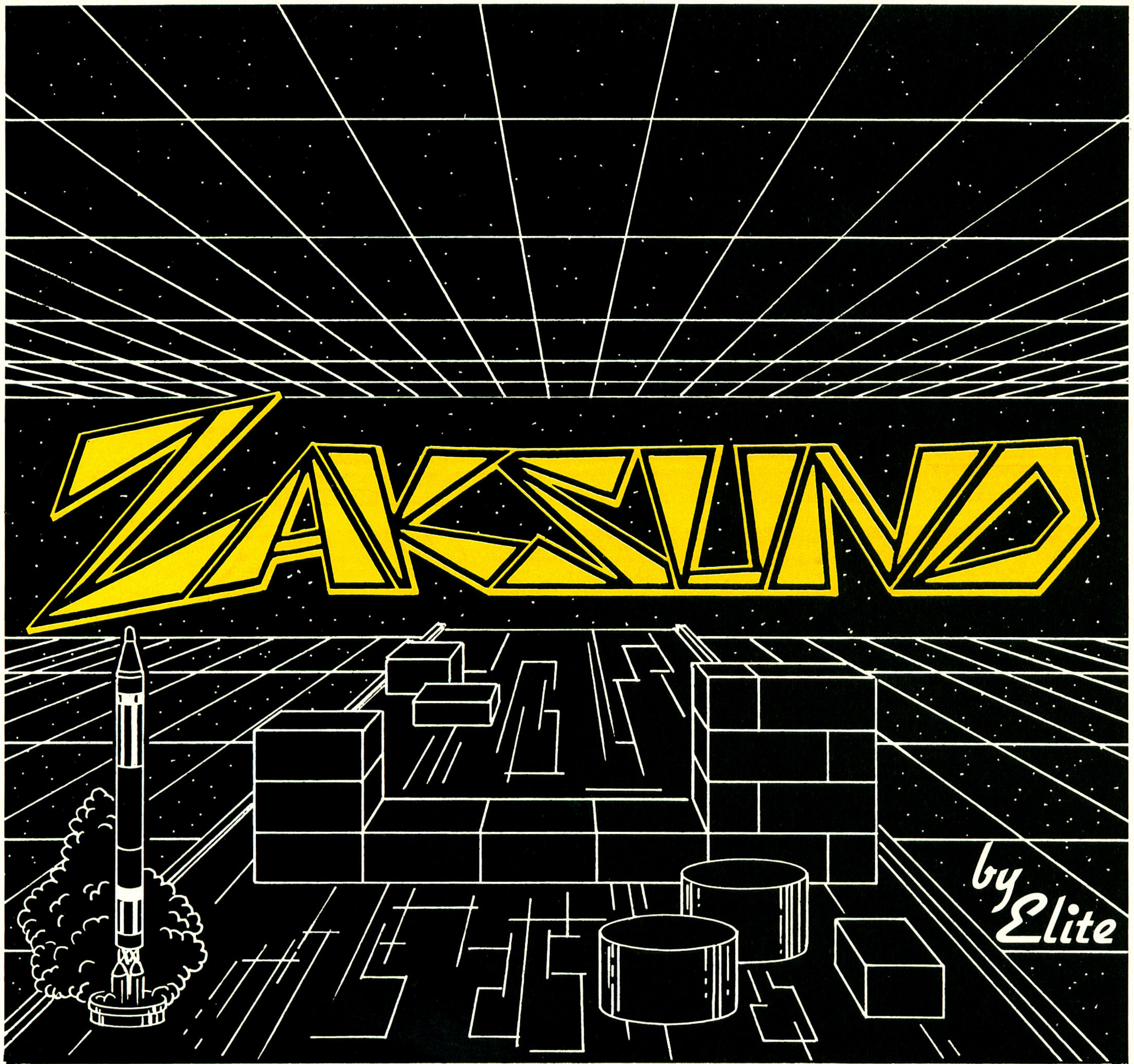

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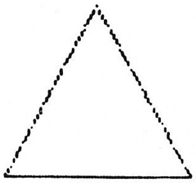
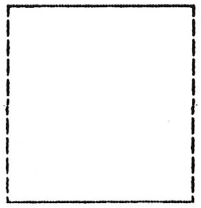
LANGUAGE

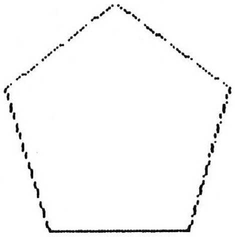
Screen Displays **Inputs**



N = 3
L = 80
X,Y = 40,40

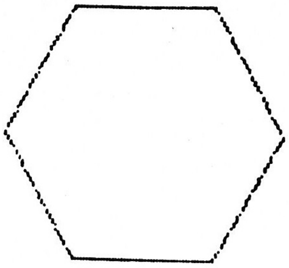


N = 4
L = 80
X,Y = 40,40

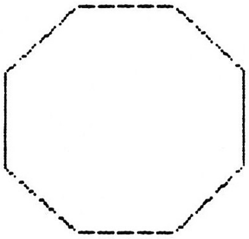


N = 5
L = 60
X,Y = 60,40

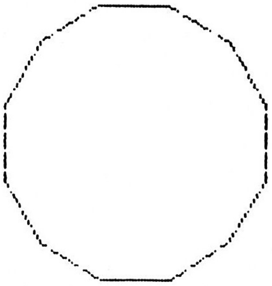
Inputs



N = 6
L = 60
X,Y = 60,40



N = 8
L = 40
X,Y = 80,40



N = 12
L = 30
X,Y = 80,40

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Mathematics teachers take great joy in pointing out to their students that a regular polygon approaches a circle as the number of sides increase and the length of the sides decrease. The Regular Polygon program can be used to demonstrate that fact. However, by making a few changes, you can put polygons alongside each other that differ in just that way. The program will automatically increase the number of sides and decrease their length as each successive polgon is drawn.

These changes will do the job:

1. Delete lines 120, 130, and 140
2. Add these lines:
    250 for N = 3 TO 15 STEP 3
    260 X1 = 18*N-54: Y1 = 80
    270 L=120/N
3. Replace lines 330 and 340 with:
    330 FOR W = 1 TO 200: NEXT W
    340 NEXT N
4. Add:
    350 IF INKEY$ = “ ” THEN 350 ELSE 110
    360 END
    370’

The complete listing follows with a sample screen display of its execution.

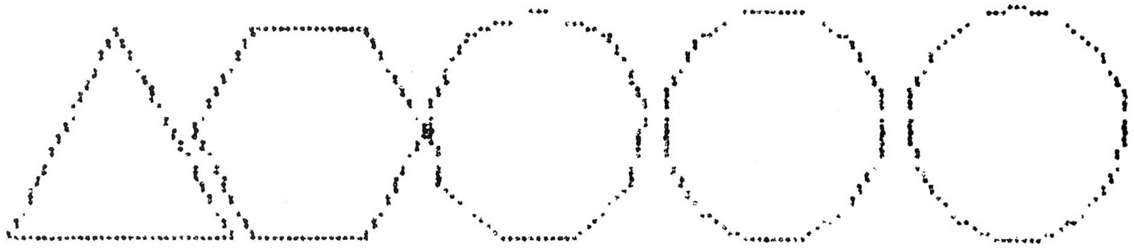
END 01C9

Listing for Manypol

```
100 REM *** INPUT ***
110 CLS
150 '
200 REM *** SCREEN SET UP ***
```

```
210 PMODE 4,1
220 PCLS1
230 COLOR 0,1
240 SCREEN 1,0
250 FOR N=3 TO 15 STEP3
260 X1=18*N-54: Y1=80
270 L=120/N
280 '
300 REM *** PROGRAM CONTROL ***
310 Y1=181-.8*Y1
320 GOSUB 5000
330 FOR W=1 TO 200: NEXT W
340 NEXT N
350 IF INKEY$="" THEN 350 ELSE110
360 END
370 '
5000 REM *** POLYDRAWSUB ***
5010 S=6.2832/N
5020 P=6.2832-S+.01
5030 FOR A = 0 TO P STEP S
5040 X2=X1+COS(A)*L
5050 Y2=Y1-SIN(A)*.8*L
5060 LINE(X1,Y1)-(X2,Y2),PSET
5070 X1=X2: Y1=Y2
5080 NEXT A
5090 RETURN
```

Screen display for Manypol Program



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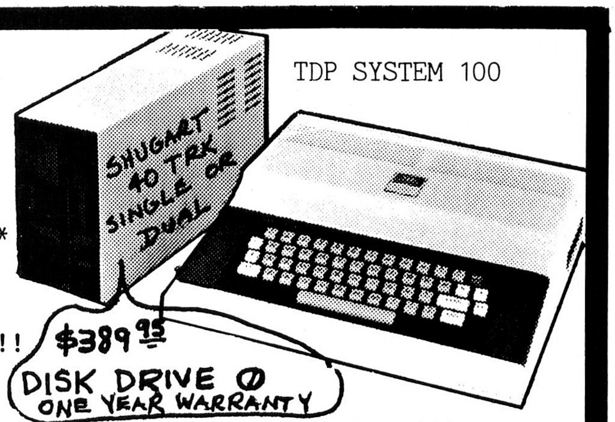

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SIMULATION

32K
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Micro-Meltdown
A Nuclear Reactor Simulation

By
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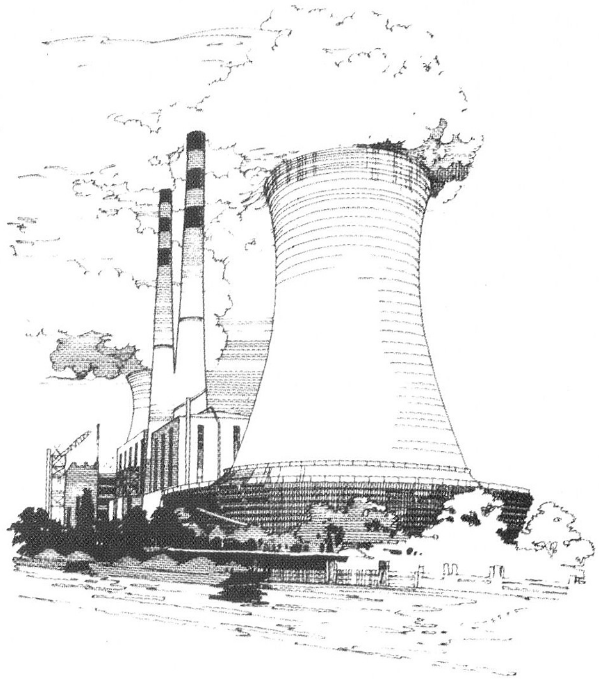
John Erickson



(Editor's Note: The following article and program, as well as others in this issue, are intended to acquaint Rainbow *readers with the concept of computer Simulations. NUKE SIM was especially commissioned by the* Rainbow *to help kick off our Simulation Contest. In order to ensure that we had a first-rate Simulation to serve as an example, we contacted two top-flight programmers whose accomplishments—Chris Latham, for instance, is the author of Donkey King—are too numerous to be listed here. Their NUKE SIM program, however, is listed here, in its entirety. Is it a good one? Well, here at the Rainbow, we feel like patrons of the arts.)*

The obvious first steps to any project based on practical engineering are toward research. In this case, the local public library provided the texts (listed below) which became the basis for the nuclear reactor simulator program, NUKE SIM.

Another extremely helpful step is the enlistment (or drafting if necessary) of a kindly engineer conversant with the field in question. In this case, engineering advice was provided by Mr. Gary Sandburg; who, when suitably bribed with a cherry walnetto, proved a marvel at digging out his old physics textbooks.

It would seem prudent to seek a general understanding of the operations involved in the selected topic; then press for the "what went wong" of it all. This time around, the events at Three Mile Island provided most helpful insight into operations (and breakdowns) in normal and extremely abnormal conditions.

A final note relates to the accuracy of NUKE SIM'S operation. A layman cannot acquire enough practical knowledge and understanding within 30 days to design and program an accurate-in-all-detail model of such a complex power plant. What follows, then, is an approximation which still has many of its own surprising quirks, compounded by others more representative of the thermodynamics involved. The program, at times, develops a curious disregard for the wishes and intentions of the operator—a disregard which remains a mystery to its authors.

The following apparati have been deleted because of memory and/or time constaints:

1	Steam generator
3	Primary coolant pumps
48	Various pumps between the turbines and the secondary feedwater pumps
28	Polishers (mineral filters)
2	Code relief valves
1	Pressure relief valve
1	Let down valve
3	Core coolant pumps
	And a partridge in a pear tree.

Workings

The operation of a nuclear power plant is much the same as that of a steam locomotive. A heat source is applied to a vessel partially filled with water, producing steam under pressure. The steam is used to either turn wheels (the *motive* in locomotive) or electrical generators (the motive in power plants). So, the simulator in hand is largely a plain old steam plant. A plant fired by oil, gas or coal would function in the same manner except, or course, its waste products would not require 150,000 years of close arrest.

The nuclear core in such a power plant is capable of 3,411 megawatts of thermal energy, which is available as 1092 megawatts of electricity—which amounts to 32 percent efficiency.This is the coal fire in the steam plant and heats the water in the primary loop. The water is kept at 2155 psi and 580° F to prevent the formation of steam voids in the loop of three-foot diameter pipes. Such voids are as effective as closed valves in preventing coolant flow.

The pressurizer is a large vessel connected to the "out" side of the reactor core vessel. This is known as the "hot" side of the loop since the coolant is at a high of 613° F. It is in the pressurizer that the one and only steam void is allowed to form in the primary loop. This void acts as an adjustable spring to provide pressure control in the loop; the adjustment being provided by a value (V1) to release steam and thus pressure and a water inlet (V2) which sprays water to cool the steam and lower the pressure.

Farther along the loop is the steam generator where the heat from the primary loop is passed to the secondary loop. The temperature is thus reduced to 547° F in the primary with a corresponding rise in temperature in the secondary. The coolant now enters the primary coolant pumps.

There are two of these pumps for each of the two steam generators—and they are of interesting size and power. The 10,000 horsepower motors can push an aggregate 270,000 gallons of coolant into the core each minute. Consider for a moment the possibilities. You could fill your swimming pool in just three seconds, the overspray easily accommodating your hot tub. You could wash your car. Away. Forever. The possibilities boggle the mind! But I digress.

Also included in the primary loop is the array of pumps and valves designed to add "makeup" coolant when necessary. (This is represented in this program by a single pump -P4).

On to the secondary or auxiliary loop. The steam generator "heat sinks" the primary loop and absorbs some 66 degrees of heat, which raises the secondary coolant parameters to about 1010 psi and 547° F. The steam thus generated is directed, first, to a high pressure and, second, to a low pressure turbine and then through a condenser which sinks remaining heat to a third coolant loop. It is this third loop which finally leaves the building and is, itself, cooled in those great thumping cooling towers. The secondary coolant, now cooled to its lowest temperature, proceeds to the "polishers" where unwanted minerals are removed and then back into the generator via the feedwater pump. And so on and so on, and round and round.

Operations

The program graphics are innocent of labels since anyone operating this program for a short length of time would soon find them redundant and distracting. Operators needing a memory refresh are advised to ask for *LIST* or EXIT after pushing (and patiently holding) the down arrow key in order to call the prompt—"Directive?". The *CLEAR* key is used to return from the RODS control.

Pumps are P1ON or P1OFF with the exception of pump 4, which must do double duty and so has the commands P4IN and P4OUT.

Valves are likewise as simple, V1OPEN or V1CLOSE will give predictable results.

In writing this program, it became necessary to have a screen dump of the graphics drawing. To do this, a short BASIC program was written that sends the upper 120 lines of the screen to a line printer VII. This short routine remains in lines 1460 to 1530, and may be used by typing *PRINT* at the 'DIRECTIVE?' question. Do make sure your printer is on.

Further than this, there is only the random trouble generator in line 1030 to warn about. The operator is advised to remain alert or introduce the letters REM right after this line number. And, of course, STOP is used to end the program.

One last and very important note: you *must CSAVE* this program immediately after typing it in!

DO NOT attempt to run it until you have the ML program in place and the whole thing on tape or on disk! Then, turn your CoCo off and then on again and *CLOAD* (or whatever). If the program should find an error and dump you while still in the graphics mode, you must type A=USR1(0) to get to someplace safe.

The Program

The program is divided into the following sections:

10—70	Housekeeping
80—670	Graphics
680—1150	Operations
1160—1800	Commmands
1810—END	Exits

A real attempt was made to make the variables indicate their functions; such as, ET(4) is the Event Timer for Operating Condition 4 (OC(4)) and AF(4) is the Alarm Flag for alarm condition 4.

Subroutines were kept as close as practicable to the "front" of the program to help speed operation. Wherever possible, if an operation was to be used more than once, it was configured as a subroutine.

And that, Bro' Jake, is about as structured as we get. In the development of *NUKE SIM,* it became apparent that information in the form of text and numbers needed to be displayed on the HI-RES screen along with the graphics. As you may know, using *DRAW* and *LINE* is not an adequate way of putting characters on the screen, mainly because of the slow speed of interpreted BASIC and the memory requirements. Therefore, an alternate means was chosen; that is, the use of a machine language program.

This program had two basic requirements. First, it had to be invisible to the BASIC program. Second, it had to be written in Position Independent Code. The latter so that it could easily be added to the end of the BASIC program, thereby avoiding two separate loads. Those familiar with the 6809 microprocessor may already understand that this is very easy to do, whereas, with other chips, it is not so easy (Hooray 6809!).

It was decided that simple *PRINT@* statements would be used to put the text on the screen. In other words, it would intercept BASIC's print to the screen routine, draw the text, then return control to BASIC. As it turns out, there is a nice hook to use for the intercept; the hook at $167. In Extended Color BASIC (which is what *NUKE SIM* is designed for), the byte at $167 contains a JMP. The next two bytes are the location, so a new address is put there; the address of the M/L program.

In reading the listing, you may note that one other hook was used, the one at $19A. This allows us to disable the *BREAK* key, thereby increasing the speed of the program. This routine is not foolproof; the *BREAK* key sometimes may still break, so I advise against pushing it. To exit the program, type STOP. This resets the hooks to their old addresses so a reset is not required.

The operation of the program will not be discussed here; the comments should shed some light. I will say, however, that an editor/assembler should be used for entering it, as it is 843 bytes long.

The steps for tying the two programs together are very simple. First, type in the BASIC program, checking for syntax errors along the way. Line 10 is very critical since this is where the machine language program is executed. The assembly program is ORGed at 0000 as is written in the listing. Now, load the BASIC program and *PRINT PEEK*(27) * 256 + *PEEK*(28). This is the end of the BASIC program. If this number were 10605, you would type *CLOADM "HIRESTXT", 10605*. The M/L program is now at the end of your BASIC program.

The last step is to change the pointers at 27 and 28. Take your number (in this case 10605), and add 843 to it (843 is the length, you'll recall). The new number would be 11448. Divide this number by 256 and poke the *whole number* (positive integer) into 27. 11448/256 = 44.71875 so 44 would be put in 27. Now, multiply 44 by 256 and subtract this from the original number (11448). This leaves 184, so poke this into 28. Do not, repeat, *do not* run the program at this time, as other pointers are not set properly. Save this program as *NUKE SIM*. Now *CLOAD* and have a good time being a nuclear engineer.

This program is intended as an example of a simulation program to help contest entrants in *the Rainbow's* upcoming event and not as a state-of-the-art mastepiece. Time constraints prevented a full debugging, (although the opportunity to prove my theory that programs are best tested by ninth grade science students was passed up with much regret) so there are centain to be flaws in the application of the laws of thermodynamics. If the reader should come across operational quirks disturbing to the intellect, he should on no account contact the authors; who have, with the printing of this page, washed their hands of the whole mess.

Bibliography:

Hodgman, Charles D., M.S. "Handbook of Chemistry and Physics" Cleveland, Ohio: Chemical Rubber Publishing Co., 1957

Martin, Daniel "Three Mile Island: Prologue or Epilogue?" Cambridge, Mass.: Ballinger, 1980

Nero Jr., Anthony V. "A Guidebook to Nuclear Reactors" Berkeley, Calif.: Univ. of Calif. Press, 1979

Stephens, Mark "Three Mile Island" New York: Random House, 1980

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130	09FE
300	0F8B
500	14A8
600	1889
800	1CF9
1000	222D
1200	274D
1400	2C79
1600	301C
1700	3358
END	366A

The listing:

```
1 '******  NUKE SIM  ********
  *NUCLEAR REACTOR SIMULATOR*
  *VERSION 1.0 COPYRIGHT (C)*
  *1983 BY JOHN ERICKSON AND*
  *CRIS LATHAM WRITTEN UNDER*
  *CONTRACT FROM THE RAINBOW*
  ****** JESUS IS LORD ******
10 CLS:CLEAR500:A=PEEK(27)*256+P
EEK(28):A=A-843:DEFUSR0=A:DEFUSR
1=A+33:A=USR0(0):PMODE3,1:PCLS(6
):GOSUB200:GOSUB210:PRINT@320,"
   RED SCREEN   HIT ENTER
 GREEN SCREEN   HIT SPACEBAR"
20 A=RND(TIMER):A$=INKEY$:IFA$="
"THEN20ELSEIFA$=CHR$(32)THENC1=7
:C2=6ELSEIFA$=CHR$(13)THENC1=6:C
2=7ELSEGOTO20
30 CLS:A=USR1(0):DIMS0(6),S1(6),
S2(6),S3(6),S4(6),S5(3),S6(3),R1
(4),A$(1),V1$(21),AF(5),AL$(5),O
C(8),OT(8):FORI=0TO3:READS5(I),S
6(I):NEXT:FORI=0TO21:READV1$(I):
NEXT:FORI=0TO5:READAL$(I):NEXT
40 DATA 78,100,160,79,160,43,212
,100,RODS,P1ON,P1OFF,P2ON,P2OFF,
P3ON,P3OFF,P4IN,P4OUT,P4OFF,HEAT
ON,HEATOFF,V1OPEN,V1CLOSE,V2OPEN
,V2CLOSE,MON1,MON2,AL,LIST,STOP,
EXIT
50 DATAREACTOR TRIPPED,PRESSURE
RELIEF VALVE OPEN,LOW COOLANT IN
 STEAM GENERATOR,PRESSURIZER HEA
TER TRIPPED,SECONDARY FEEDWATER
PUMP OFF,TURBINES TRIPPED
60 TIMER=0:OT=0:RH=32:CTP=97:PP=
2155:P1=2155:PT=580:PW=200:GW=28
8:SP=1010:ST=547:OC(1)=1:OC(2)=1
:R=2129.9955:SR=2059.1161:PV=212
1.1:VS=1060.55:GV=3700:TC=547:TH
=613:A1$="V31L10004GL5G-":A2$="L
100BL5C"
70 A3$="L255V2001ADCFBP155V31ADC
FBAGEDV15ADCFBAGEDV6ADCFBV4AGED"
:GOTO1160
80 PMODE3,1:COLOR4,1:V$="L2D1G1D
4F1D1R2BR11R2U1E1U4H1U1L2":P$="D
```

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```
10L24U10R6E6R6F6":FORI=1TO4:PCLS
1:DRAW"BM24,6XP$;":ONI GOTO90,10
0,110,120
90 GET(6,1)-(22,15),S0,G:DRAW"BM
15,1D14R2U14":GET(6,1)-(22,15),S
1,G:NEXT
100 DRAW"BM8,8R14D1L14D1R14":GET
(6,1)-(22,15),S2,G:NEXT
110 DRAW"BM11,3M+12,+10D1M-12,-1
0D1M+12,+10":GET(6,1)-(22,15),S3
,G:NEXT
120 DRAW"BM22,3M-12,+10D1M+12,-1
0D1M-12,+10":GET(6,1)-(22,15),S4
,G:PCLS1
130 DRAW"C1;BM0,0R2D1;C4D33L2NU3
3D1":COLORC1:DRAW"R2":GET(0,0)-(
3,35),R1,G:COLOR4:PCLS1:GOSUB140
:GOSUB150:GOSUB370:GOSUB400:GOSU
B160:GOSUB260:GOSUB430:GOSUB510:
PAINT(31,112),C1,4:GOSUB200:GOTO
210
140 DRAW"BM73,107D6L44U10L15U40R
15U58R104D102R74D6L110U6R28U96L8
9D43R28D32R20U6L4H8U21L14U40R6D3
6R8E8R4U28R6D28R4F8D25G8L4D10L31
U32L22D5R14D40L14D4R35BM80,70R14
D5L14U5BM84,0D5R6U5BM255,107L24D
6R24BM58,0D5R6U5":RETURN
150 DRAW"BM124,100NU80L6H8U65E8R
6BR8ND80R7F8D3R8U6R8D12L16D14R8D
6L8D30R8D6L9G8L5BM179,24NL8D6R28
U6R8D12L44U12BM222,24D62L12U5H3L
8ND17L9G3D5L8D6R8D5F3R3NU17R11NU
17R3E3U5R20U68L7":RETURN
160 DRAW"BM178,50R26D18R18D6L25U
18L18U6BM255,68L24D6R24BM183,24L
32U19R32D19U8NR19U1NR19U1NR19U1R
19U8D19R32U19NL32D8R21D1L21D1R21
D1L21BM230,40R10D4R15BD4L15D8R15
BD4L15D4L10BL8L10U24R9"
170 DRAW"BM180,16L3G5L15U5L4U3R4
U5R15F5R4":PAINT(162,15),4,4:DRA
W"BM232,16L3G5L15U5L4U3R4U5R15F5
R4":PAINT(228,15),4,4
180 DRAW"BM96,105XP$;BM178,48XP$
;BM178,84XP$;BM230,105XP$;BM56,2
0XV$;BM82,20XV$;":PAINT(60,0),C2
,4:PAINT(60,20),C2,4:PAINT(218,7
3),C2,4:PAINT(235,73),C2,4:PAINT
(234,112),C2,4:LINE(215,51)-(239
,51),PSET:PAINT(227,52),C1,4:PAI
NT(227,50),4,4
190 PAINT(194,35),4,4:PAINT(217,
52),C2,4:PAINT(237,52),C2,4:PAIN
T(217,50),C1,4:PAINT(237,50),C1,
4:COLORC1:LINE(215,51)-(221,51),
PSET:LINE(233,51)-(239,51),PSET:
COLOR4:RETURN
200 PRINT@320,STRING$(192," ");:
RETURN
210 PMODE4,1:SCREEN1,1:PMODE3,1:
RETURN
220 REM RODS UP OR DOWN
230 IFCTP>100THENRETURNELSERM=FI
X((CTP+1)/3):IFRM=RH THENRETURNE
LSEIFRM>RH THEN250ELSEFORK=RM TO
RH:GOSUB260:RH=RH-1:NEXTK
240 RH=FIX((CTP+1)/3):RETURN
250 FORK=RH TORM:GOSUB260:RH=RH+
1:NEXTK:GOTO240
260 PUT(20,62-RH)-(23,97-RH),R1,
PSET:RETURN
270 REM PUMP MOTORS
280 WP=WP+1:IFWP=5THENWP=1
290 FORI=0TO2:IFOC(I+1)=0THENGOS
UB350:NEXTELSEONWP GOSUB310,320,
330,340:NEXT
300 IFOC(I+1)=0THEN350ELSEIFOC(I
+2)=1THENONWP GOTO310,320,330,34
0ELSEONWP GOTO310,340,330,320
310 PUT(S5(I),S6(I))-(S5(I)+16,S
6(I)+14),S1,PSET:RETURN
320 PUT(S5(I),S6(I))-(S5(I)+16,S
6(I)+14),S4,PSET:RETURN
330 PUT(S5(I),S6(I))-(S5(I)+16,S
6(I)+14),S2,PSET:RETURN
340 PUT(S5(I),S6(I))-(S5(I)+16,S
6(I)+14),S3,PSET:RETURN
```

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```
350 PUT(S5(I),S6(I))-(S5(I)+16,S
6(I)+14),S0,PSET:RETURN
360 REM VALVE 1 OPEN OR CLOSED
370 IFOC(7)=0THEN380ELSEDRAW"C1B
M86,24R14U3D6BM90,24C4R14U3D6":A
=PPOINT(86,26):COLORA:DRAW"BM86,
0D4R2U4BD12D12L2U12":COLOR4:RETU
RN
380 DRAW"C1BM90,24R14U3D6BM86,24
C4R14U3D6":DRAW"BM86,0C1D4R2U4BD
12D11L2U11":COLOR4:RETURN
390 REM VALVE 2 OPEN OR CLOSED
400 IFOC(8)=0THEN410ELSEDRAW"C1B
M62,24L14U3D6C4BM58,24L14U3D6":C
OLORC2:DRAW"BM60,24D26R2NU26R10U
1L10U1R10":RETURN
410 DRAW"C1BM58,24L14U3D6C4BM62,
24L14U3D6":A=PPOINT(74,48):COLOR
A:DRAW"BM60,25D25R2NU25R10U1L10U
1R10C4":RETURN
420 REM PRESSURIZER WATER LEVEL
430 PW(1)=FIX((PW-100)/17):IFPW<
101THEN460ELSEIFPW>400THEN470ELS
EIFPW(1)=PW(2) THENRETURNELSEPW(
2)=PW(1):PW(3)=0:COLORC2:GOSUB45
0:LINE(74,68-PW(1))-(102,68-PW(1
)),PSET:PAINT(86,68-PW(1)+1),C1,
C2:PAINT(86,68-PW(1)-1),4,C2:COL
OR4
440 LINE(74,68-PW(1))-(102,68-PW
(1)),PSET:GOSUB450:COLORC1:LINE(
84,80)-(90,80),PSET:COLOR4:GOSUB
370:GOTO400
450 DRAW"BM84,80L4H8U25E8R4U15R6
D15R4F8D25G8L10BM80,70R14D5L14U5
":RETURN
460 PW(2)=5:IFPW(3)=1THENRETURNE
LSEPW(3)=1:COLORC2:GOSUB450:PAIN
T(86,79),4,C2:COLOR4:GOSUB450:CO
LORC1:LINE(84,80)-(90,80),PSET:C
OLOR4:GOSUB370:GOTO400
470 PW(2)=5:IFPW(3)=1THENRETURNE
LSEPW(3)=1:COLORC2:GOSUB450:PAIN
T(86,25),C1,C2:COLOR4:GOSUB450:C
OLORC1:LINE(84,80)-(90,80),PSET:
COLOR4:GOSUB370:GOTO400
480 REM HEATON OR HEATOFF
490 IFOC(6)=1THENPAINT(87,74),C1
,4:RETURNELSEPAINT(87,74),1,4:RE
TURN
500 REM STEAM GENERATOR LINE 2
510 GW(1)=FIX((GW-30)/11.4):IFGW
<30THEN570ELSEIFGW(1)=GW(2)THENR
ETURNELSEGW(2)=GW(1):IFGW>600THE
NRETURNELSEGW(3)=0:COLORC2:GOSUB
550:LINE(113,86-GW(1))-(122,86-G
W(1)),PSET:LINE(135,86-GW(1))-(1
44,86-GW(1)),PSET
520 A=PPOINT(146,86-GW(1)):IFA=C
2 ORA=C2-4THEN530ELSELINE-(154,8
6-GW(1)),PSET
530 PAINT(116,86-GW(1)+1),C1,C2:
PAINT(137,86-GW(1)+1),C1,C2:PAIN
T(116,86-GW(1)-1),4,C2:PAINT(137
,86-GW(1)-1),4,C2:COLOR4:LINE-(1
35,86-GW(1)),PSET:LINE(113,86-GW
(1))-(122,86-GW(1)),PSET:IFPPOIN
T(199,99)=4THENCOLORC1:GOSUB560:
PAINT(199,99),C1,C2
540 IFPPOINT(199,99)=8THENCOLORC
2:GOSUB560:PAINT(199,99),C1,C2:C
OLOR4:GOSUB560:GOTO550ELSEGOTO55
0
550 DRAW"BM124,100NU80L6H8U65E8R
6BR8ND80R7F8D3R8U6R8D12L16D14R8D
6L8D30R8D6L9G8L5":IFAF(5)=1THEND
RAW"BM154,30R8":LINE(154,25)-(15
4,29),PRESET:LINE(162,25)-(162,2
9),PRESET:RETURNELSERETURN
560 DRAW"BM222,51D35L12U5H3L8ND1
7L9G3D5L8D6R8D5F3R3NU17R11NU17R3
E3U5R20U41L7":RETURN
570 GW(2)=30:IFGW(3)=1THENRETURN
ELSEGW(3)=1:COLORC2:GOSUB550:PAI
NT(136,99),4,C2:PAINT(121,99),4,
C2:GOSUB560:PAINT(199,99),4,C2:C
OLOR4:GOSUB550:GOTO560
580 REM PRIM LOOP WATER INLET
590 IFOC(4)=1ANDOC(5)=0THENPAINT
(243,112),C1,4:COLORC1:GOTO600EL
```

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```
SEIFOC(4)=1THENPAINT(243,112),C2
,4:COLORC2:GOTO600ELSEPAINT(243,
112),C2,4:COLORC1
600 DRAW"BM204,112L70U1R70U1L70U
1R70U1L70C4":RETURN
610 REM PUMP3 WATER INLET
620 IFOC(3)=1THENCOLORC2:DRAW"BM
152,51L4D1R4D1L4D1R4D1L4":COLOR4
:RETURNELSEDRAW"BM152,51L4D1R4D1
L4D1R4D1L4":GW(2)=60:GOTO510
630 DRAW"BM46,6R9F1L12G1R15D1L15
F1R12BM106,6R13F1L15D1R15D1L15F1
R13":RETURN
640 COLORC1:GOSUB630:COLOR4:RETU
RN
650 COLOR1
660 DRAW"BM154,25R8D1L8D1R8D1L8D
1R8BR8R8U1L8U1R8U1L8U1R8BR28R8D1
L8D1R8D1L8D1R8BR8R8U1L8U1R8U1L8U
1R8":IFPPOINT(154,25)=5THENCOLOR
4ELSECOLOR1
670 DRAW"BM164,30D6R2U6R2D6BR48U
6R2D6R2U6":COLOR4:RETURN
680 PO=(3411*CTP*.0032):IFAF(5)=
1THENPO=0:RETURNELSERETURN
690 AT$="":CC=0
700 A$=INKEY$:IFA$=""THEN700ELSE
IFLEN(AT$)>10THEN1370ELSEIFA$=CH
R$(13)THENRETURNELSEIFA$=CHR$(8)
THEN710ELSEIFA$<CHR$(48)THEN700E
LSEAT$=AT$+A$:CC=CC+1:PRINTA$;:S
OUND150,1:GOTO700
710 IFCC=0THEN700ELSECC=CC-1:SOU
ND150,1:PRINTA$;:AT$=LEFT$(AT$,C
C):GOTO700
720 T=FIX((TIMER+OT)/60):IFTIMER
=>60000THENOT=OT+TIMER:TIMER=0:R
ETURNELSERETURN
730 IFP1<400THENIV=1.17:RETURNEL
SEIV=.4:RETURN
740 PRINT@448,USING"Elapsed time
: #### min  ## sec";FIX(T/60);(T
-FIX(T/60)*60):RETURN
750 IFINKEY$=CHR$(12)ORPEEK(342)
=247THENRETURN
760 IFP1=>2500THENGOSUB1830:PRIN
T@320,"**PRESSURE ABOVE DESIGN L
IMITS**     ***SIMULATION OVER**
*":GOTO1110
770 IFP1=>2355ORPT>620THENCTP=7:
GOSUB1420:GOSUB230:GOTO790ELSEIF
P1<1650ANDPT>575THENCTP=7:GOSUB1
420:GOSUB230:GOTO790
780 GOTO800
790 IFAF(0)=0THENGOSUB1840:FORI=
1TO2:PLAYA1$:PRINT@480,"********
REACTOR  TRIPPED********";CHR$(5
);:PLAYA2$:NEXT:AF(0)=1
800 IFP1=>2255ANDOC(7)=0THENOC(7
)=1:ET(7)=T:GOSUB370ELSE820
810 IFAF(1)=0THENGOSUB1840:FORI=
1TO2:PLAYA1$:PRINT@480,"***PRESS
URE RELIEF VALVE OPEN***";CHR$(5
);:PLAYA2$:NEXT:AF(1)=1
820 IFEM(3)=1THENPW=PW-((T-ET(9)
)*.01667):ET(9)=T:VS=PV-(PW*5.3)
:GOSUB430:GOSUB1130:GOSUB1150
830 G2=GV-(GW*5.72):IFGW<150THEN
GF=GW/150ELSEIFGW>150ANDGF<300TH
ENGF=1ELSEIFGW>300THENGF=GW/300
840 TC=TH-(CTP*.01*66*GF)
850 ST=TC:SP=(ST+460)*SR/G2:IFOC
(2)=0ANDAF(5)=0THENGOSUB650:GOSU
B1840:FORI=1TO2:PLAYA1$:PRINT@48
0,"********TURBINES TRIPPED*****
***";CHR$(5);:PLAYA2$:NEXT:AF(5)
=1
860 IFOC(2)=1ANDGW>100ANDAF(5)=1
ANDSP<1110THENGOSUB660:AF(5)=0
870 IFGW<100ANDAF(2)=0THENFORI=1
TO2:PLAYA1$:PRINT@480,"*LOW COOL
ANT IN STEAM GENERATOR*";CHR$(5)
;:PLAYA2$:NEXT:AF(2)=1
880 IFGW>100ANDAF(2)=1THENAF(2)=
0
890 IFPW<101THENOC(6)=0:GOSUB490
ELSE910
900 IFAF(3)=0THENGOSUB1840:FORI=
1TO2:PLAYA1$:PRINT@480,"***PRESS
```

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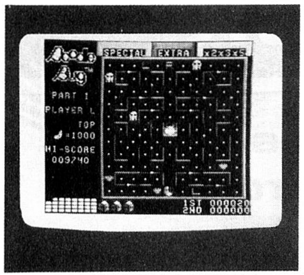

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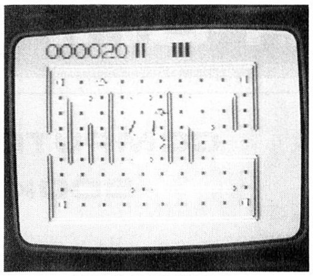

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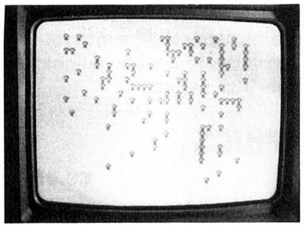

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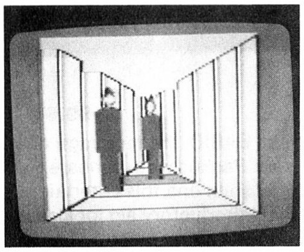

PHANTOM SLAYER

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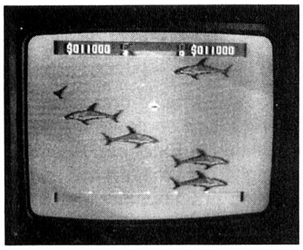

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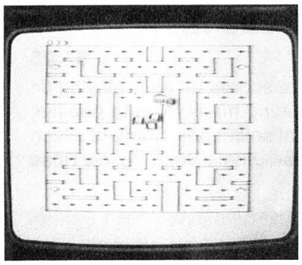

GHOST GOBBLER

Ghost Gobbler is an excellent version of Pac-Man™. You must gobble all the food dots while avoiding the ghosts. There are four energizer dots which will make the ghosts turn blue and become scared. This is the best copy of the arcade game. 16K.
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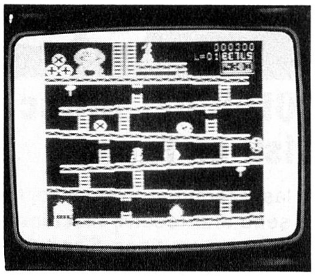

DONKEY KING

Using the four stages from the original acrade game, with your joystick in hand try to jump the barrels, collect the pins, manuever your way past the falling jacks, and figure out the crazy conveyor belts. Written by Tom Mix, this ones sure to become a classic! 32K.
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5) . . . . SPACE RACE
6) . . . . ASTRO BLAST
7) . . . . SHARK TREASURE
8) . . . . PACDROIDS
9) . . . . HAYWIRE
10) . . . . RAIL RUNNER

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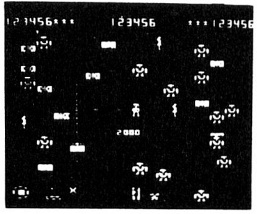

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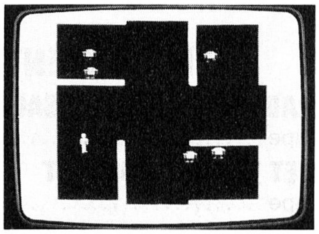

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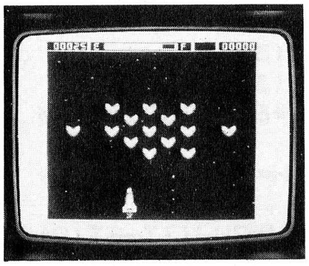

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Your routine space patrol in an outer galaxy sector becomes a life and death struggle with alien invasion forces advancing towards Earth. Wave after wave of attack squadrons challenge you in this super hi-res machine language shoot-em-up game. One or two players. 16K.
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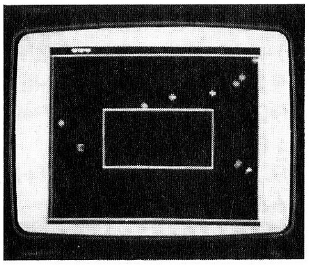

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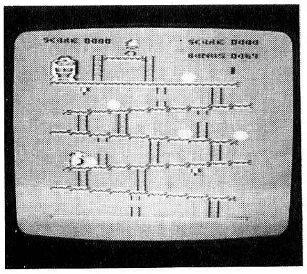

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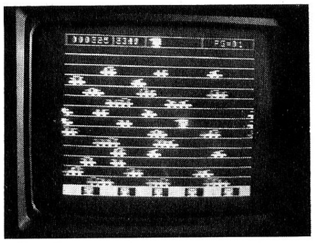

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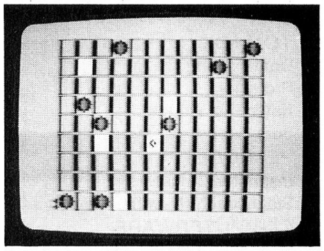

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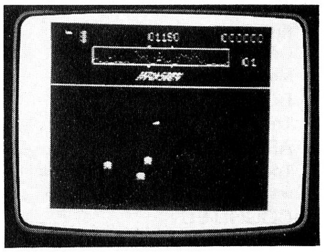

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Fantastic arcade game comes to life on your Color Computer screen. Upon entering each room you'll find new treasures and new challenges. Using your joystick, get the treasure while fending off the attacking creatures. This great new adaptation be Aardvark will put excitement back into your Color Computer. 16K
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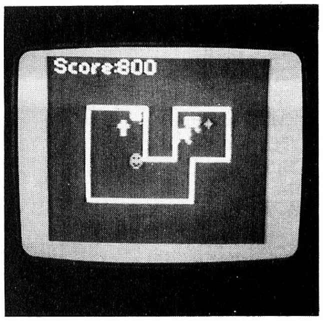

GOLF

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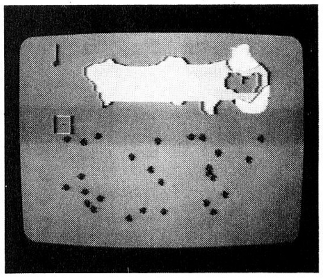

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```
URIZER HEATER TRIPPED***";CHR$(5
);:PLAYA2$:NEXT:AF(3)=1
910 IFPW>100THENAF(3)=0
920 TH=TC+(CTP*.01*66):GOSUB1130
:GOSUB1140
930 IFOC(1)=0THENTH=TH+(CTP*.01*
66):GOSUB1130
940 IFOC(2)=0THENGW=GW-((T-ET(2)
)*2.4):ET(2)=T:GOSUB510ELSE960
950 IFAF(4)=0THENGOSUB1840:FORI=
1TO2:PLAYA1$:PRINT@480,"**SECOND
ARY FEEDWATER PUMP OFF**";CHR$(5
);:PLAYA2$:NEXT:AF(4)=1
960 IFOC(3)=1THENGW=FIX(GW+((T-E
T(3))*3.03)):ET(3)=T:GOSUB510
970 IFOC(4)=1THEN980ELSE990
980 IFOC(5)=0THENPW=PW-((T-ET(5)
)*.4):VS=PV-(PW*5.3):ET(5)=T:GOS
UB430:GOSUB1130:TH=TH+1ELSEIFOC(
5)=1THENGOSUB730:PW=PW+((T-ET(4)
)*IV):VS=PV-(PW*5.3):ET(4)=T:GOS
UB430:GOSUB1130:TH=TH-1
990 IFOC(7)<>0THENP1=FIX(P1*EXP(
-(T-ET(7))/106.4)):ET(7)=T:GOSUB
1140
1000 IFOC(7)=1ANDP1<2205THENOC(7
)=0:GOSUB370:GOSUB1840:PRINT@480
,"Pressure Relief Valve CLOSED";
1010 IFOC(8)=1THENPR=TH/P1:TH=TH
-T+ET(8):ET(8)=T:P1=TH/PR:GOSUB1
140:GOSUB430
1020 IFOC(6)=1THENPR=TH/P1:TH=TH
+T-ET(6):ET(6)=T:P1=TH/PR:GOSUB1
140:GOSUB430
1030 A=RND(100):IFA=20ORA=40ORA=
60ORA=80THENONA/20 GOSUB1770,178
0,1790,1800
1040 GOSUB740
1050 IFPW>401THENPW=401ELSEIFPW=
<0THENPW=1:IFSV=1THEN1060ELSEGOS
UB630:SV=1
1060 IFSV=0THEN1070ELSEIFOC(1)=1
ANDOC(4)=1ANDOC(5)=1ANDPW>5THENS
V=0:GOSUB640
1070 IFGW<1THENGW=0
1080 FORI=0TO5:IFAF(I)=1THENX=X+
1:NEXTELSENEXT
1090 IFX<>0THENPRINT@0,CHR$(5);"
AL";CHR$(5);:X=0ELSEIFX=0THENPRI
NTCHR$(5);:PRINT@0,"  ":PRINTCHR
$(5);
1100 PT=(TC+TH)/2:IFPT=>705.2THE
NPAINT(31,112),4,4:GOSUB1830:PRI
NT@320,"***CRITICAL WATER TEMPER
ATURE***      ***SIMULATION OVER*
**":PLAYA3$ELSE1120
1110 IFINKEY$=""THEN1110ELSEPLAY
A3$:GOTO1820
1120 IFINKEY$=CHR$(12)ORPEEK(342
)=247THENRETURNELSE280
```

```
1130 P1=R*(TH+460)/VS:RETURN
1140 IFOC(4)=1ANDOC(5)=1ANDPW<10
THENGOSUB730:PW=PW+((T-ET(4))*IV
):VS=PV-(PW*5.3):ET(4)=T:GOSUB42
0:GOSUB1120:TH=TH-1:RETURNELSEVS
=R*(TH+460)/P1:PW=(PV-VS)/5.3:GO
SUB430:RETURN
1150 TH=(P1*VS/R)-460:RETURN
1160 CLS:PRINT@172,"WARNING":PRI
NT@227,"NUCLEAR REACTOR SIMULATO
R-":PRINT@258,"CONTENTS MAY BE R
ADIOACTIVE!":PRINT@291,"PROCEED
AT YOUR OWN RISK!":PRINT@362,"aL
ARM CANCEL":PRINT@390,"cONTINUE
SIMULATION"
1170 FORI=1TO250:NEXT:IFINKEY$="
A"THEN1190
1180 PRINT@172,"warning":PLAYA1$
:PRINT@172,"WARNING":PLAYA2$:IFP
EEK(339)=254THEN1190ELSEIFPEEK(3
41)=254THEN1200ELSE1180
1190 IFINKEY$<>"C"THEN1190
1200 CLS:PRINT@98,"NUCLEAR REACT
OR SIMULATOR:":PRINT@160,"OBJECT
:PRODUCE 97%+ ELECTRIC":PRINTTAB
(7)"POWER":PRINT@224,"OBJECT:MAI
NTAIN PRIMARY LOOP":PRINTTAB(7)"
TEMPERATURE @ 580 DEG F":PRINT@2
88,"OBJECT:MAINTAIN PRIMARY LOOP
"
1210 PRINTTAB(7)"PRESSURE @ 2155
 PSI":PRINT@352,"OBJECT:MAINTAIN
 PRESSURIZER":PRINTTAB(7)"WATER
LEVEL @ 200 IN":PRINT@455,"rEADY
?"
1220 IFINKEY$<>"R"THEN1220
1230 CLS:PRINT@98,"NUCLEAR REACT
OR SIMULATOR:":PRINT@160,"OBJECT
:MAINTAIN SECONDARY LOOP":PRINTT
AB(7)"TEMPERATURE @ 547 DEG F":P
RINT@224,"OBJECT:MAINTAIN SECOND
ARY LOOP":PRINTTAB(7)"PRESSURE @
 1010 PSI"
1240 PRINT@288,"OBJECT:MAINTAIN
STEAM GENERATOR":PRINTTAB(7)"WAT
ER LEVEL @ 288 IN":PRINT@455,"rE
ADY?"
1250 IFINKEY$<>"R"THEN1250
1260 CLS:PRINT@66,"NUCLEAR REACT
OR SIMULATOR:":PRINT@128,"CONTRO
L RODS:RAISE & LOWER WITH":PRINT
TAB(8)"ARROW KEYS":PRINT@192,"PU
MPS:SPECIFY PUMP BY NUMBER &":PR
INTTAB(8)"DIRECTIVE. EX.'P1ON'"
1270 PRINT@256,"VALVES:SPECIFY V
ALVE BY NUMBER":PRINTTAB(8)"& DI
RECTIVE":PRINTTAB(8)"EX. 'V1OPEN
'":PRINT@352,"PRESSURIZER WATER
HEATER:":PRINTTAB(8)"SPECIFY DIR
ECTIVE":PRINTTAB(8)"EX. 'HEATON'
```

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```
":PRINT@456,"rEADY?";
1280 IFINKEY$<>"R"THEN1280
1290 PL=200:CLS:PRINT@261,"SIMUL
ATION BEGINS.....":A=USR0(0):GOS
UB80:PLAYA3$
1300 GOSUB1830:GOTO1690
1310 GOSUB1830
1320 PRINT@320,;:GOTO1340
1330 GOSUB1840:PRINT@480,;:
1340 PRINT"Directive?";:GOSUB690
:D$=AT$:IFD$="TC"THEN1450ELSEIFD
$="PRINT"THEN1460
1350 FORI=0TO21:IFD$=V1$(I)THENO
C=I:GOTO1380
1360 NEXT
1370 PRINT@480,"Directive?INVALI
D DIRECTIVE     ";:FORI=1TO2:PLA
Y"L7V31O1CP10":NEXT:PRINT@490,"
                ":PRINT@480,;:GO
TO1340
1380 ON OC+1GOTO1390,1540,1550,1
560,1570,1580,1590,1600,1600,163
0,1640,1660,1670,1680,1710,1720,
1690,1750,1860,1730,1820,1810
1390 GOSUB1840:PRINT@480,"Contro
l Rods-Manual Control";
1400 PRINT@320,USING"Core Therma
l Power     ### %   ";CTP
1410 IFPEEK(341)=247THENCTP=CTP+
1:GOSUB1420:GOTO1400ELSEIFPEEK(3
42)=247THENCTP=CTP-1:GOSUB1420:G
OTO1400ELSEA$=INKEY$:IFA$=CHR$(1
2)THENGOSUB1840:RETURNELSE1410
1420 IFCTP<0THENCTP=0ELSEIFCTP>1
00THENCTP=100
1430 IFCTP>7THENAF(0)=0
1440 GOSUB230:RETURN
1450 TC$="":FORI=1TO8:TC$=TC$+ST
R$(OC(I)):NEXT:PRINT@480,TC$;:RE
TURN
1460 A=USR1(0):A$="":PMODE4,1:PR
INT#-2,CHR$(18);CHR$(13);
1470 FORI=0TO6:P(I)=FIX(2^I):NEX
TI
1480 FORI=0TO118STEP7:FORJ=0TO25
5:A=128:FORK=0TO6
1490 IFPPOINT(J,I+K)=0THENA=A+P(
K)
1500 NEXTK
1510 IFJ<200THENA$=A$+CHR$(A)ELS
EB$=B$+CHR$(A)
1520 IFJ=255THENPRINT#-2,A$;B$;C
HR$(13);:A$="":B$=""
1530 NEXTJ,I:GOTO1820
1540 OC(1)=1:GOSUB1840:PRINT@480
,"Reactor Coolant Pump ON";:RETU
RN
1550 OC(1)=0:GOSUB1840:PRINT@480
,"Reactor Coolant Pump OFF";:RET
URN
1560 OC(2)=1:AF(4)=0:GOSUB1840:P
RINT@480,"Secondary Feedwater Pu
mp ON";:RETURN
1570 OC(2)=0:AF(4)=1:GOSUB1850:G
OSUB1840:PRINT@480,"Secondary Fe
edwater Pump OFF";:ET(2)=T:RETUR
N
1580 OC(3)=1:GOSUB1840:PRINT@480
,"Auxiliary Makeup Pump ON";:GOS
UB620:ET(3)=T:RETURN
1590 OC(3)=0:GOSUB1840:PRINT@480
,"Auxiliary Makeup Pump OFF";:GO
SUB620:RETURN
1600 GOSUB1840:OC(4)=1:EM(3)=0:I
FD$="P4IN"THENOC(5)=1:GOSUB590EL
SEIFD$="P4OUT"THENOC(5)=0:GOSUB5
90
1610 IFOC(5)=1THENET(4)=T:GOSUB1
840:PRINT@480,"Primary Makeup Pu
mp ON";:RETURN
1620 IFOC(5)=0THENET(5)=T:GOSUB1
840:PRINT@480,"Primary Let-down
Pump ON";:RETURN
1630 GOSUB1840:OC(4)=0:EM(3)=0:G
OSUB590:IFOC(5)=1THENPRINT@480,"
Primary Makeup Pump OFF";:OC(5)=
0:RETURNELSEPRINT@480,"Primary L
et-down Pump OFF";:RETURN
1640 OC(6)=1:ET(6)=T:GOSUB1840:I
FPW<100THEN1650ELSEPRINT@480,"Pr
essurizer Heater ON";:GOSUB490:R
ETURN
1650 OC(6)=0:PRINT@480,"Pressuri
zer Heater TRIPPED";:GOSUB490:RE
TURN
1660 OC(6)=0:GOSUB1840:PRINT@480
,"Pressurizer Heater OFF";:GOSUB
490:RETURN
1670 OC(7)=2:ET(7)=T:AF(1)=1:GOS
UB1840:PRINT@480,"Pressure Relie
f Valve OPEN";:GOSUB370:RETURN
1680 OC(7)=0:AF(1)=0:GOSUB1840:P
RINT@480,"Pressure Relief Valve
CLOSED";:GOSUB370:RETURN
1690 GOSUB720:PRINT@320,USING"Co
re Thermal Power    #### MWth";(
CTP*.01*3411):PRINTUSING"Primary
 Loop Press    #### PSI";P1:PRIN
TUSING"Primary Loop Temp     ###
# DEG";PT:PRINTUSING"Pressurizer
 Level      ### IN";PW
1700 GOSUB750:IFINKEY$=CHR$(12)O
RPEEK(342)=247THENGOSUB1330:GOTO
1690ELSE1690
1710 GOSUB1840:OC(8)=1:ET(8)=T:P
RINT@480,"Pressurizer Coolant Sp
ray ON";:GOSUB400:RETURN
1720 GOSUB1840:OC(8)=0:PRINT@480
,"Pressurizer Coolant Spray OFF"
;:GOSUB400:RETURN
```

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```
1730 GOSUB1830:PRINT@320,;:FORI=
0TO20:PRINTV1$(I)":";:NEXT:PRINT
"EXIT";
1740 IFPEEK(342)<>247THENGOSUB75
0:GOSUB720:GOTO1740ELSEGOSUB1830
:RETURN
1750 GOSUB720:GOSUB680:PRINT@320
,USING"Plant Electric Output ###
# MWe ";PO:PRINTUSING"Secondary
Loop Press #### PSI";SP:PRINTUS
ING"Secondary Loop Temp   #### D
EG";ST:PRINTUSING"Steam Gen Wate
r Level  ### IN";GW
1760 GOSUB750:IFPEEK(342)=247ORI
NKEY$=CHR$(12)THENGOSUB1330:GOTO
1750ELSE1750
1770 OC(7)=2:ET(7)=T:AF(1)=1:GOS
UB370:RETURN
1780 OC(2)=0:ET(2)=T:RETURN
1790 IFOC(4)<>1THENEM(3)=1:ET(9)
=T:COLORC1:DRAW"BM255,111L22D1R2
2":COLOR4:RETURNELSERETURN
1800 RETURN
1810 A=USR1(0):PW(2)=1000:GW(2)=
1000:GOTO1200
1820 A=USR1(0):CLS:PRINT@128,;:L
IST1:END
1830 PRINT@320,STRING$(192," "):
RETURN
1840 PRINT@480,STRING$(32," ");:
RETURN
1850 EM(3)=0:RETURN
1860 GOSUB1830:PRINT@320,;:FORI=
0TO5:IFAF(I)=1THENPRINT"*"AL$(I)
:NEXT:GOTO1740ELSENEXT:GOTO1740
```

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```
0001 0600                    NAM HIRESTXT

                    * THIS PROGRAM IS TO BE USED
                    * WITH NUKE SIM - THE NUCLEAR
                    * REACTOR SIMULATOR.

0002 0600                    ORG 0000         MAKE IT PIC

0003 0000 6D8C31    START    TST <TOGLE,PCR   NOT 0
0004 0003 261B               BNE B@           NOT ON
0005 0005 6C8C2C             INC <TOGLE,PCR   FOR RESET
0006 0008 BE0168             LDX $168         GET HOOK
0007 000B AF8C27             STX <VEC,PCR     SAVE IT
0008 000E 308C68             LEAX <HRSTXT,PCR NEW HOOK
0009 0011 BF0168             STX $168         STORE IT
0010 0014 BE019B             LDX $19B         GET HOOK
0011 0017 AF8C1E             STX <BRKVEC,PCR  SAVE IT
0012 001A 308C1D             LEAX <BRKCLR,PCR NEW HOOK
0013 001D BF019B    A@       STX $19B         STORE IT
0014 0020 39        B@       RTS              TO BASIC
0015 0021 6D8C10    RESET    TST <TOGLE,PCR   NOT 1
0016 0024 27FA               BEQ B@           NO RESET
0017 0026 6F8C0B             CLR <TOGLE,PCR   FOR SET
0018 0029 AE8C09             LDX <VEC,PCR     GET OLD VEC
0019 002C BF0168             STX $168         RESTOR HOOK
0020 002F AE8C06             LDX <BRKVEC,PCR  SAME AS
0021 0032 20E9               BRA A@           ABOVE STEPS

0022 0034 00        TOGLE    FCB 0
0023 0035 0000      VEC      FDB 0
0024 0037 01        INVERT   FCB 1
0025 0038 0000      BRKVEC   FDB 0

0026 003A 3407      BRKCLR   PSHS A,B,CC
0027 003C F60155             LDB 341          THE PROGRAM
0028 003F 86F7               LDA #247         NEEDS THE
0029 0041 B7FF02             STA $FF02        ARROW KEYS
0030 0044 B6FF00             LDA $FF00        BUT WITH
0031 0047 8A80               ORA #128         BREAK DIS-
0032 0049 81F7               CMPA #247        ABLE THE
0033 004B 2704               BEQ B@           AREA WHERE
0034 004D CA08               ORB #8           THE KEYS
0035 004F 2002               BRA C@           ARE READ IS
0036 0051 C4F7      B@       ANDB #247        NOT UP-
                    * DATED PROPERLY
0037 0053 F70155    C@       STB 341          SO IT IS
0038 0056 F60156             LDB 342          DONE HERE.
0039 0059 86EF               LDA #239         TO UNDER-
0040 005B B7FF02             STA $FF02        STAND HOW
0041 005E B6FF00             LDA $FF00        THIS WORKS
0042 0061 8A80               ORA #128         READ PAGE
0043 0063 81F7               CMPA #247        33 OF THE
0044 0065 2704               BEQ D@           COLOR
0045 0067 CA08               ORB #8           COMPUTER
0046 0069 2002               BRA E@           TECHNICAL
0047 006B C4F7      D@       ANDB #247        REFERENCE
0048 006D F70156    E@       STB 342          MANUAL.
0049 0070 3507               PULS A,B,CC      RESTORE REG
0050 0072 3262               LEAS 2,S         PULL RETURN
0051 0074 1CAF               ANDCC #$AF       ADDRESS AND
```

```
0052 0076 7EADA5             JMP $ADA5        CLEAR THE
                    * INTERUPT MASKS. THEN JUMP TO
                    * THE AREA OF BASIC THAT RUNS
                    * THE PROGRAM, BYPASSING THE
                    * BREAK CHECK ROUTINE.

0053 0079 3436      HRSTXT PSHS D,X,Y
0054 007B 8108               CMPA #8          BACKSPACE?
0055 007D 10270099           LBEQ BACKSP      YES THEN GO
0056 0081 8105               CMPA #5          INV. CHARS?
0057 0083 260A               BNE ALPHA        NO THEN CHR
0058 0085 E68CAF             LDB INVERT,PCR   FLIP INVERT
0059 0088 C801               EORB #1          FLAG THEN
0060 008A E78CAA             STB INVERT,PCR   RETURN
0061 008D 201A               BRA RET
0062 008F C63F      ALPHA    LDB #63          NUMBER
                    * OF CHARACTERS USED BY NUKE SIM
0063 0091 318D0093           LEAY LETTA,PCR   FIRST LETT
0064 0095 A1A0      A@       CMPA ,Y+         ASCII
0065 0097 2730               BEQ FOUND        GOT IT?
0066 0099 3127               LEAY 7,Y         NO, NEXT
0067 009B 5A                 DECB             ALL 63?
0068 009C 26F7               BNE A@           NO, NEXT
0069 009E C605               LDB #5           5 DESCENDER
0070 00A0 A1A0      B@       CMPA ,Y+         ASCII
0071 00A2 2707               BEQ DESCEN       GOT IT?
0072 00A4 3127               LEAY 7,Y         NO, NEXT
0073 00A6 5A                 DECB             ALL DONE?
0074 00A7 26F7               BNE B@           TRY NEXT
0075 00A9 35B6      RET      PULS D,X,Y,PC    TO BASIC

0076 00AB 8D22      DESCEN BSR FNDLOC
0077 00AD C605               LDB #5           5 BLANKS
0078 00AF E78D0039           STB DRCHAR+1,PCR CHANGE PROG
0079 00B3 C639               LDB #$39         RTS CODE
0080 00B5 E78D005B           STB BOT,PCR      PUT IN STA
0081 00B9 8D30               BSR DRCHAR       GO DRAW IT
0082 00BB C603               LDB #3           RESTORE
0083 00BD E78D002B           STB DRCHAR+1,PCR PROGRAM
0084 00C1 C6A7               LDB #$A7         STA CODE
0085 00C3 E78D004D           STB BOT,PCR      CHANGE RTS
0086 00C7 20E0               BRA RET          GOTO BASIC

0087 00C9 8D04      FOUND    BSR FNDLOC
0088 00CB 8D1E               BSR DRCHAR       DRAW IT
0089 00CD 20DA               BRA RET          RETURN

0090 00CF DC88      FNDLOC LDD <$88
                    * CURSOR POSITION KEPT BY BASIC
0091 00D1 3404               PSHS B           SAVE 0-31
0092 00D3 44                 LSRA             MOVE BIT 0
0093 00D4 56                 RORB             INTO B REG
0094 00D5 54                 LSRB             NOW MOVE
0095 00D6 54                 LSRB             INTO LOWER
0096 00D7 54                 LSRB             NYBBLE OF B
0097 00D8 54                 LSRB             REGISTER
0098 00D9 860C               LDA #12          12 LINES
0099 00DB 3D                 MUL              PER CHAR.
0100 00DC 8620               LDA #32          32 BYTES
0101 00DE 3D                 MUL              WIDE.
```

```
0102 00DF 1F01                 TFR D,X        TO X
0103 00E1 3504                 PULS B         NOW GET
0104 00E3 C41F                 ANDB #31       POSITION
0105 00E5 3A                   ABX            ACROSS
0106 00E6 DCBC                 LDD <$BC       START OF HI
0107 00E8 308B                 LEAX D,X       RES SCREEN
0108 00EA 39                   RTS            ALL DONE

                        * CHARACTERS WITHOUT DESCENDERS
                        * ARE MADE UP OF 3 BLANK ROWS,
                        * 7 DATA ROWS, 2 BLANK ROWS.
                        * DESCENDERS ARE 5 AND 7
0109 00EB C603          DRCHAR LDB #3
0110 00ED 4F                   CLRA           ABOVE CHAR
0111 00EE 6D8DFF45             TST INVERT,PCR WHICH COLOR
0112 00F2 2701                 BEQ C@         0 = W ON B
0113 00F4 43                   COMA           FLIP B ON W
0114 00F5 3402          C@     PSHS A         SAV AWILE
0115 00F7 A784          D@     STA ,X         ON SCREEN
0116 00F9 308820               LEAX 32,X      NEXT ROW
0117 00FC 5A                   DECB           ALL DONE?
0118 00FD 26F8                 BNE D@         NO, NEXT
0119 00FF C607                 LDB #7         7 ROWS TALL
0120 0101 A6A0          NXTBYT LDA ,Y+        DATA
0121 0103 6D8DFF30             TST INVERT,PCR CHECK COLOR
0122 0107 2701                 BEQ E@         0 = W ON B
0123 0109 43                   COMA           B ON W
0124 010A A784          E@     STA ,X         TO SCREEN
0125 010C 308820               LEAX 32,X      NEXT ROW
0126 010F 5A                   DECB           ALL 7?
0127 0110 26EF                 BNE NXTBYT     NEXT BYTE
0128 0112 3502                 PULS A         RETRIEVE A
0129 0114 A784          BOT    STA ,X         BOTTOM 2
0130 0116 A78820               STA 32,X       ROWS ALSO
0131 0119 39                   RTS            ALL DONE

0132 011A 17FFB2        BACKSP LBSR FNDLOC    WHERE
0133 011D 301F                 LEAX -1,X      BACKSPACE
0134 011F 318D01CE             LEAY SPACE+1,PCR BLANK CHAR
0135 0123 8DC6                 BSR DRCHAR     PUT IT ON
0136 0125 16FF81               LBRA RET       DONE

                        * NOT ALL LETTERS ARE INCLUDED
                        * HERE, ONLY THOSE THAT ARE USED
                        * IN THE BASIC PROGRAM .
                        * EACH CHARACTER IS SEVEN ROWS
                        * TALL. THE HEX NUMBER IS THE
                        * ASCII CODE FOR THE COMPARE
                        * USED TO FIND EACH DATA BLOCK

0137 0128 41183C6666    LETTA  FCB $41,24,60,102,102
0138 012D 7E6666               FCB 126,102,102

0139 0130 427C66667C    B      FCB $42,124,102,102,124,102
0140 0136 667C                 FCB 102,124

0141 0138 433C666060    C      FCB $43,60,102,96,96,96,102
0142 013F 3C                   FCB 60

0143 0140 44786C6666    D      FCB $44,120,108,102,102,102
```

```
0144 0146 6C78                 FCB 108,120

0145 0148 457E60607C    E      FCB $45,126,96,96,124,96,96
0146 014F 7E                   FCB 126

0147 0150 467E60607C    F      FCB $46,126,96,96,124,96,96
0148 0157 60                   FCB 96

0149 0158 473C666060    G      FCB $47,60,102,96,96,110,102
0150 015F 3C                   FCB 60

0151 0160 486666667E    H      FCB $48,102,102,102,126,102
0152 0166 6666                 FCB 102,102

0153 0168 493C181818    I      FCB $49,60,24,24,24,24,24,60

0154 0170 4A06060606    J      FCB $4A,6,6,6,6,6,102,60

0155 0178 4B66666C78    K      FCB $4B,102,102,108,120,108
0156 017E 6666                 FCB 102,102

0157 0180 4C60606060    L      FCB $4C,96,96,96,96,96,96,126

0158 0188 4D667E7E66    M      FCB $4D,102,126,126,102,102
0159 018E 6666                 FCB 102,102

0160 0190 4E66767E7E    N      FCB $4E,102,118,126,126,110
0161 0196 6666                 FCB 102,102

0162 0198 4F3C666666    O      FCB $4F,60,102,102,102,102,102
0163 019F 3C                   FCB 60

0164 01A0 507C66667C    P      FCB $50,124,102,102,124,96,96
0165 01A7 60                   FCB 96

0166 01A8 513C666666    Q      FCB $51,60,102,102,102,118,108
0167 01AF 3A                   FCB 58

0168 01B0 527C66667C    R      FCB $52,124,102,102,124,108
0169 01B6 6666                 FCB 102,102

0170 01B8 533C66603C    S      FCB $53,60,102,96,60,6,102,60

0171 01C0 547E181818    T      FCB $54,126,24,24,24,24,24,24

0172 01C8 5566666666    U      FCB $55,102,102,102,102,102
0173 01CE 663C                 FCB 102,60

0174 01D0 5666666666    V      FCB $56,102,102,102,102,102
0175 01D6 3C18                 FCB 60,24

0176 01D8 5766666666    W      FCB $57,102,102,102,102,126
0177 01DE 7E66                 FCB 126,102

0178 01E0 5866663C18    X      FCB $58,102,102,60,24,60,102
0179 01E7 66                   FCB 102

0180 01E8 5966663C18    Y      FCB $59,102,102,60,24,24,24
0181 01EF 18                   FCB 24
```

Sugar Software

AUTO RUN

SEE YOU AT RAINBOWFEST!

Auto Run is a utility program for the TRS-80* Extended Basic Color Computer. It is used to add convenience and professionalism to your software.

Auto Run will help you create your title screen with the graphics editor. The graphics editor allows you to choose a background color and border style. Using the arrow keys and several other commands you can draw pictures, block letters and also include text.

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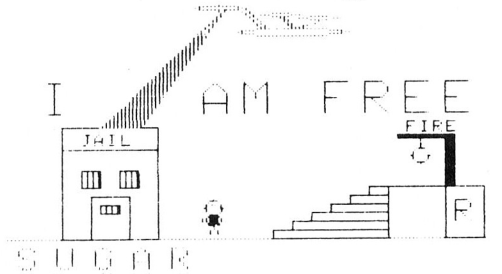
Also you may record a vocal or musical introduction preceding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above $600 (the PCLEAR 0 page).

Software authors: The Auto Run prefix may be appended to your software products.

Auto Run is **$14.95** and includes complete documentation and an assembly source listing.
Requires 16K Extended Basic.

Galactic Hangman



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SS-002 - Sing Along	SS-006 - Adventure/Sci-Fi
SS-003 - X-Rated	SS-007 - Potpourri

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```
0182 01F0 5A7E060C18 Z      FCB $5A,126,6,12,24,48,96,126

0183 01F8 6100003C06 LA     FCB $61,0,0,60,6,62,102,62

0184 0200 6260607C66 LB     FCB $62,96,96,124,102,102,102
0185 0207 7C                FCB 124

0186 0208 6300003C66 LC     FCB $63,0,0,60,102,96,102,60

0187 0210 6406063E66 LD     FCB $64,6,6,62,102,102,102,62

0188 0218 6500003C66 LE     FCB $65,0,0,60,102,126,96,60

0189 0220 663C666078 LF     FCB $66,60,102,96,120,96,96
0190 0227 60                FCB 96

0191 0228 6860607C66 LH     FCB $68,96,96,124,102,102,102
0192 022F 66                FCB 102

0193 0230 6918001818 LI     FCB $69,24,0,24,24,24,24,24

0194 0238 6B60666C78 LK     FCB $6B,96,102,108,120,108
0195 023E 6666              FCB 102,102

0196 0240 6C18181818 LL     FCB $6C,24,24,24,24,24,24,24

0197 0248 6D0000667E LM     FCB $6D,0,0,102,126,126,102
0198 024F 66                FCB 102

0199 0250 6E00007C66 LN     FCB $6E,0,0,124,102,102,102
0200 0257 66                FCB 102

0201 0258 6F00003C66 LO     FCB $6F,0,0,60,102,102,102,60

0202 0260 7200007C66 LR     FCB $72,0,0,124,102,96,96,96

0203 0268 7300003C60 LS     FCB $73,0,0,60,96,60,6,60

0204 0270 7400183C18 LT     FCB $74,0,24,60,24,24,24,12

0205 0278 7500006666 LU     FCB $75,0,0,102,102,102,102
0206 027F 3E                FCB 62

0207 0280 7600006666 LV     FCB $76,0,0,102,102,102,60
0208 0287 18                FCB 24

0209 0288 7700006666 LW     FCB $77,0,0,102,102,126,126
0210 028F 66                FCB 102

0211 0290 780000663C LX     FCB $78,0,0,102,60,24,60,102

0212 0298 7A00007C0C LZ     FCB $7A,0,0,124,12,24,48,124

0213 02A0 303C666E7E N0     FCB $30,60,102,110,126,118
0214 02A6 663C              FCB 102,60

0215 02A8 3118381818 N1     FCB $31,24,56,24,24,24,24,60

0216 02B0 323C66060C N2     FCB $32,60,102,6,12,24,48,126

0217 02B8 333C66061C N3     FCB $33,60,102,6,28,6,102,60

0218 02C0 340E1E3666 N4     FCB $34,14,30,54,102,126,6,6

0219 02C8 357E607C06 N5     FCB $35,126,96,124,6,6,102
0220 02CF 3C                FCB 60

0221 02D0 363C66607C N6     FCB $36,60,102,96,124,102,102
0222 02D7 3C                FCB 60

0223 02D8 377E06060C N7     FCB $37,126,6,6,12,24,48,96

0224 02E0 383C66663C N8     FCB $38,60,102,102,60,102,102
0225 02E7 3C                FCB 60

0226 02E8 393C66663E N9     FCB $39,60,102,102,62,6,102
0227 02EF 3C                FCB 60

0228 02F0 2000000000 SPACE  FCB $20,0,0,0,0,0,0,0

0229 02F8 25304A3408 PERCNT FCB $25,48,74,52,8,44,82
0230 02FF 0C                FCB 12

0231 0300 2718181800 APOST  FCB $27,24,24,24,0,0,0,0

0232 0308 2A10543838 ASTERK FCB $2A,16,84,56,56,84
0233 030E 1000              FCB 16,0

0234 0310 3A00181800 COLON  FCB $3A,0,24,24,0,24,24
0235 0317 00                FCB 0

0236 0318 3F3C66060C QUEST  FCB $3F,60,102,6,12,24,0
0237 031F 18                FCB 24

                     * THESE LETTERS COME LAST
                     * BECAUSE THEY HAVE DESCENDERS

0238 0320 673C666666 LG     FCB $67,60,102,102,102,62
0239 0326 063C              FCB 6,60

0240 0328 6A06060606 LJ     FCB $6A,6,6,6,6,6,102,60

0241 0330 707C666666 LP     FCB $70,124,102,102,102,124
0242 0336 6060              FCB 96,96

0243 0338 713E666666 LQ     FCB $71,62,102,102,102,62
0244 033E 0606              FCB 6,6

0245 0340 796666663C LY     FCB $79,102,102,102,60,24
0246 0346 3060              FCB 48,96

0247 0348 000000            FCB 0,0,0
                     * THREE ZEROS ARE NEEDED HERE TO
                     * MAKE THIS PROGRAM WORK WHILE
                     * TACKED ONTO THE END OF THE
                     * BASIC PROGRAM.

0248 034B                   END START
```

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Enhancements:

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- **A separate printer driver for NEC and OKIDATA printers.**
- **Page numbering.**
- **Print page headings.**
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Enhancements:

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Software Review . . .

Speak Up! Speaks For Itself

With today's rapid gains in technology and the resulting drop in the cost of electronic components, digitally synthesized voice is becoming more and more common in our everyday lives. We have automobiles with little voices that tell us when we have left our headlights on, vending machines that talk to us and even computers that deliver sales pitches over the phone. Now *Speak Up!*, a 100% software speech synthesis program, lets the CoCo communicate with the real world in a voice of its own.

Speak Up is a machine language program that is capable of reproducing 37 of the most common English language phonemes on the CoCo's television speaker. (The phoneme is the fundamental unit of speech). The cassette on which it is delivered contains both a copy for 16K machines and a copy for 32K machines. Both versions take up less than 7K bytes of memory and run in one of two modes, (1) an interactive mode where words and sentences to be spoken are typed on the keyboard and (2) a BASIC program mode where *Speak Up!*'s input is passed in by a running program.

After a quick pass through *Speak Up!*'s complete, clear and informative documentation, I was ready to fire up my CoCo and hear its first ever spoken words. Running *Speak Up!* in the interactive mode, it was with great anticipation that I typed at the prompt, those immortal, timeless words, "HELLO WORLD!" Sure enough, my CoCo announced itself with its newfound voice and I was pleasantly surprised by the quality of the voice emanating from the speaker.

Speak Up! produces meaningful, understandable sounds by scanning the words and sentences input to it for certain letter pairs and single letters that it can pronounce. For example, the letter sequence CH produces a sound such as found in the word "chip." Sounds are strung together to produce coherent output. Punctuation in the input string produces varying periods of silence; a space (like between words of a sentence) causes a single, silent pause to be output, a comma causes two pauses and a period, three. All other characters (i.e. numbers and other punctuation) are ignored.

The author's desire to keep *Speak Up!* a reasonable size, coupled with the inherent complexities and inconsistencies of the English language, make it relatively easy to fool *Speak Up!*'s letter to-phoneme mapping scheme. For example, the word "champagne" comes out sounding like "CHAMP-AG-NN." By the use of a little creative spelling (i.e. "SHAMPAYN" in the example above), proper pronunciation can be obtained. With the letter-to-sound chart attached to *Speak Up!*'s documentation and some practice, I was quickly able to figure out alternate spellings for almost any word, like COMPYEWTER for "computer" and FIEV for "five."

Running *Speak Up!* in the BASIC program mode also proved to work out well. There are clear examples on how to interface to both Color BASIC (via *"PRINT*@0 (DATA)" statements) and Extended Color BASIC (via *DEFUSR* and *USR* functions) contained in the documentation. It was an extremely simple exercise to write a program to read text files out loud (although enhancement to look for and re-spell "problem" words would have added some polish to my program). The number of applications for *Speak Up!* seems to be limitless.

Overall, I am impressed with the quality of *Speak Up!* and its documentation and feel that it is a tool that would make a nice addition to any CoCo software library.

(Classical Computing, Inc., P.O. Box 12247, Lexington, KY 40582, $29.95)

—Gary E. Epple

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Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW*, P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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1

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2

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4

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Software Review . . .

File Cabinet: Excellent Utility For The Adventurous

In search of a versatile filing program with the flexibility of a Data Base system, I eagerly pored over *File Cabinet* from Moreton Bay Software.

As I read the narrative, I discovered that the author has included two adaptions of the basic program, a Recipe File and an Address File, complete with sample data files.

These additional programs were included to demonstrate the versatility of the BASIC program. The documentation for this program consists of nine pages of running narrative which primarily describes how to find *Tomatoes in Salad* (Salad is the Data File for Recipe).

I can't wait for the salad, I have to get to the meat of the program, the *File Cabinet.* After all, it can't be that difficult to set up a file.

CLOAD, okay. *RUN* okay. Read the title page and copyright, okay. Next screen, CREATE or LOAD. Since I don't have a tape file, I select CREATE which then prompts for the number of Entries (Fields) per Record, 2-20. After *ENTERing,* the screen proudly displays the number of Records available in menory using an average of 10 characters per field. Is this enough? A No response automatically reduces the average field size to increase the amount of available records. This is great.

The next prompt is for a file name. Then, enter field names by prompt. An incorrect entry, what to do? No instructions, the Adventure begins. (I begin to thing of *File Cabinet* as sort of a "Utility Adventure," but the command TAKE LAMP sheds no light.) At the end of the Field Name entry, there is a prompt, "CORRECT Y/N." But, no response will have you redo *all* field names.

After naming the fields, the ADD or MENU prompt appears. At this point, the author wisely suggests that you enter a few trial records to develop familiarity with the commands and functions. Good Advice.

We now have a few records with a few fields. The Adventure continues. Let's examine the MAINTENANCE MENU, the most complete I've seen for the CC.

ADD, simple enough. SORT, by selected field, great! No, wait, danger lurks! The ASCII sort routine thinks a 2 is larger than 15 unless you avoid this peril by using leading zeros.

CHANGE and DELETE. Unfortunately, these commands will only allow access to one record in the file before returning to the MENU.

FIND will locate multiple occurrences in a specified field of any character or string. This is very useful to aid in locating records for CHANGE and DELETE, but you need a scratch pad and pencil.

LIST, sort of an Inventory command to let you see your file "treasures" on the screen—if the record data will fit on one screen. You can page through records in sort order or return to the menu.

REMAINING MEM. is a nice feature for small machines or large files. Select this option to display bytes and record space available.

MAIN MENU, there are five corridors out of here. MAINTENANCE MENU takes you back to where you were. SAVE takes you to cassette. QUIT takes you to Basic (GOTO 10 will get you back with your data). TOTAL will total a field from all or selected records. The total is only displayed on screen with a record count and numeric average.

REPORT, the most versatile, yet least described function. When you get here, it's like getting through *Raaka-Tu* with only half enough points. The function call is self-prompting, but somewhat confusing. The first prompt, *Print to Screen or Printer,* is selected. The output for either option is similar except on Screen, you must page through all selected records with end of file being your only access back to the menu.

The next prompt is for an arithmetic field. If Y, you are prompted for *number of 1st entry field.* Once done, you can select the appropriate math function from +, -, * and /. The program then adds a new field to every record and asks for the 2nd entry field. This is the numeric value you wish to use. This value is placed in the added field. The next prompt is to name the (results) field.

You are then allowed to select which fields will be printed and if you want the field heading printed. Each field is printed at the left margin which makes it difficult to format any type of table.

The final series of prompts in this routine ask which fields to select if you did not select an earlier ALL fields prompt. The next prompt, *Input search start parameter,* was confusing until I remembered the ASCII trap. You can enter any value that will find a match in your selected field. The *Input end parameter* will allow you to select a range of values within a field. At last, *press any key to print.*

I believe I managed to escape with all the treasures the *File Cabinet* Unility Adventure contains. This filing program is the best I've seen for the CC and is very close to being outstanding in its function, but the documentation needs to be rewritten so that all the functions in this program can be fully exploited other than by the trial-and-error, or "Adventure," method. Now, if we can only get an ML sort routine included . . .

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—Ed Sehlhorst

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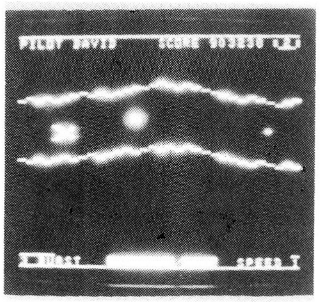

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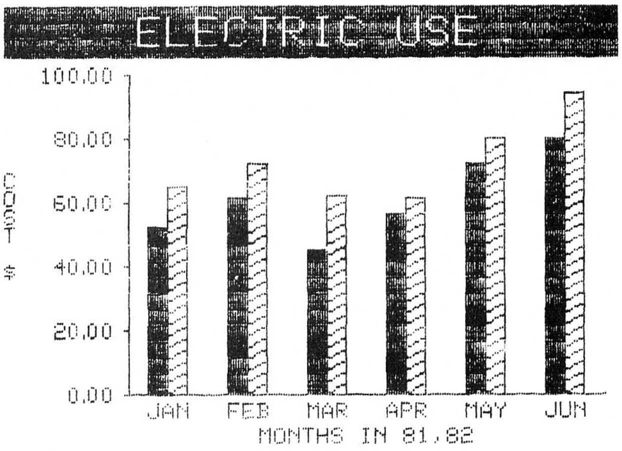
Software Review . . .

Bar Zapper: Well-Documented Tool For Color Computer



Screen Print using the *Bar Zapper* and Custom Software Screen Print Program

Radio Shack w/LP-100 Printer

If a picture is worth a thousand words, what is a high resolution bar graph worth?

Plenty! To anyone who works with numbers, forecasts, computations and statistics.

There is nothing like a graph to convert a series of comparative figures into an instantly understandable visual presentation.

Bar Zapper is the second graph preparation program from Southern Software Systems, following their original *Graph Zapper* program. While *Graph Zapper* creates line graphs, *Bar Zapper* makes bar graphs (logical enough).

For those unfamiliar with bar graphs, they are the type of graphs which represent and compare statistics in the form of columns or towers rising or falling (for negative values) from a base line.

Bar graphs allow instant comparisons of values. A taller column represents a value greater than a shorter column. Easy...

With *Bar Zapper*, the Color Computer produces high quality bar graphs using data entered by answering a series of inquiries generated by the program.

Bar Zapper allows you to:

- Add bars to the graph
- Change bars on a graph
- Insert bars in an existing graph
- Delete bars from an existing graph
- List the data which the CoCo will use to generate the graph and allow changes
- Save and load the data and completed graphs to or from disk or tape.

The user defines the minimum and maximum values for the bars, the number of bars and sub-bars (more about that later) and if there will be lines crossing the graph or not. Using these variables, a custom graph is created. Each axis of the graph is labeled and each bar can be titled. A unique staircase label option allows longer bar titles by slanting the titles downward so they won't run into each other. In addition, the entire graph can be labeled with a reversed title banner across the top of the screen.

While the above may seem complex, the program is extremely easy to use and is supported by a concise 23-page manual which answers most possible questions, including what to do if the program aborts.

The main event is when you zap (print) the graph on the screen. The title appears, followed by the bars, followed by the titles. Beautiful!

The graphs are displayed using *PMODE4* for the highest resolution. So you are limited to a choice of two color combinations, either green and black, or buff and black. Instead of using different colors to differentiate between the bars you have a choice of five different types of bars. While different colors would be more desirable, the various designs are very unique with little chance of confusing the bars.

After the graph is zapped, it can be changed or stored for future reference.

In *Bar Zapper* each bar represents a whole value. Comparisons are made between two or more values by using the sub-bar option where a group of bars are presented connected to each other. In the example, the graph shows six bars, each consisting of a bar and one sub-bar. The maximum number of bars for *Bar Zapper* is 24, with up to five sub-bars for the 32K version and three sub-bars for the 16K. The 32K zapper contains many nice extras which are omitted from the 16K zapper because of lack of memory.

After your graph is zapped on the screen, now what? *Graph Zapper* allows the printing of your graph using a screen print program and a printer with graphics capabilities. A set of modifications are included in the *Bar Zapper* instructions to automatically make hard copies using the screen print program from Custom Software Engineering. If you have a 32K CoCo, this modification allows you to make screen prints with the push of a button.

When *Bar Zapper* was printed using the Radio Shack Screen Print Program (now discontinued), the print included a black line across the bottom of the graph which wasn't on the graph. Using Custom Software's program, there was no such problem. The two programs were designed to merge together and I would highly recommend doing so to get full use from *Bar Zapper*.

In summary, *Bar Zapper* is a well-prepared and documented tool for the Color Computer. (Custom Software Engineering has the recommended *Screen Print Program*. They're at 807 Minuteman Causeway, Cocoa Beach, FL 32931.)

(Southern Software Systems, 485 Tropical Trail, Suite 109, Merritt Island, FL 32952, 16K tape version, $15.95; 32K version for tape or disk, $19.95.)

—Bruce Rothermel

ROBOTTACK and COLORPEDE

COLORPEDE

This truly outstanding engineer designed, 100% machine language game with multi-colored high resolution characters and fast action will challenge the most avid arcade buff. Can be played by 1 or 2 players controlled with joy sticks or key board. Joy stick control is fast, smooth and accurate. As COLORPEDE slithers through the toad stools, you attempt to destroy the COLORPEDE, knock out the menacing Bouncing Bug and eliminate toad stools while accumulating higher and higher scores. Demonstration mode with top 5 scores. Pause feature. For 16K Color Computer and TDP-100.

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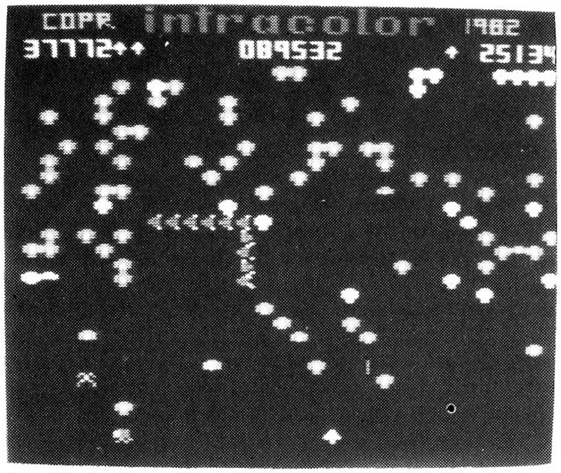

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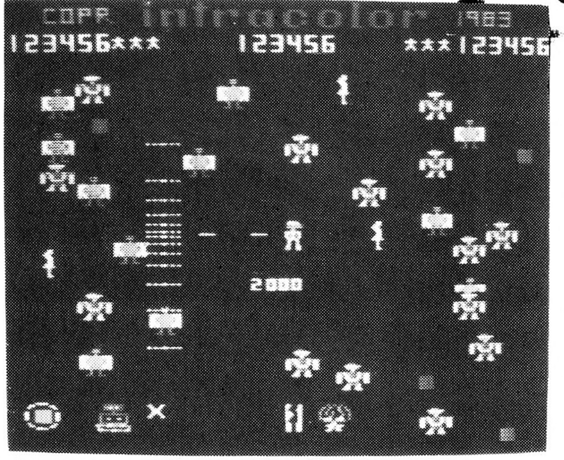

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FOR THE COLOR COMPUTER & TDP-100

Software Review . . .

Super "Color" Disk Zap Adds The Missing Capabilities

The Radio Shack Disk Operating System has many capabilities. With it, you can load and save files and data. You can list the files on disk, copy and rename files, and backup your disks. At first glance, it would seem that it can satisfy all of your needs. But what if the system decides to clobber the directory? Or, what if you decide that you want to inspect or modify a portion of the disk, or a file on the disk? All of a sudden, the system seems to have fewer capabilities.

Super Color Disk Zap is a machine language disk utility program that has many useful features. With it, you can inspect or modify your disks in any manner desired. You can also display the directory, and print any portion of the disk. It also supports the transmitting of files to another computer using the RS-232 port. In addition, it has a verify function that will find the bad spots on a disk, a copy function to copy sectors to any drive and sector, a locate function to find any ASCII or hexadecimal string, and a kill function to delete any file. It supports up to four drives and even supports drives with more than 35 tracks.

Using *Super Color Disk Zap* is easy. After you load the program, it auto-executes and displays a title screen while the rest of the program is being loaded. After the program is loaded, the master menu is displayed with a choice of 12 commands. If I were to completely describe every command, and the variations thereof, you would have to spend the next half-hour or so reading this review. The purpose of a review, I feel, is to provide an overview of the product's functions and operating features, and to help you decide if you should purchase it or not. With that in mind, let's see what *Super Color Disk Zap* can do.

The DIRECTORY command, as you might guess, displays the disk directory on your screen. The display is formatted into two columns and includes the number of free granules. If you have a lot of files on your disk, the display will pause when the screen is filled. Pressing any key will display the next page or return you to the menu if it is the last page. When the program reads the directory, it also checks the file allocation table for errors. If it finds one, the file name is flagged to warn you of the error.

The VERIFY command is probably the best of all. When it is invoked, it searches the entire disk for errors. If one is found, it will pause and display the track and the sector in error so that you can attempt to fix it. While reviewing this program, I recalled having a disk that I could not backup. All I knew was that the backup command gave me an I/O error, and I could not load one of my files. This seemed like a good test of the VERIFY command, so naturally I tried it. When I did, I was not only informed as to where the error was, but I was also told what type of error it was. A quick glance at the documentation explained exactly how this type of error might be fixed. Following the instructions I proceeded to "fix" the disk. After that I did another VERIFY of the disk and, sure enough, there were no errors. Although I had no reason to doubt what the program was telling me about my disk, I exited the program and proceeded to load the file that was previously bad. Not only was I able to load the file and backup the disk, but the file was completely intact and did not require any additional changes to be made. If you have ever lost an important file or disk due to some unknown error, the feature alone is worth the entire

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price of the program.

The FILE ZAP command allows you to display and/or modify any file on the disk. When invoked, a sub-menu is displayed. The commands available from this menu include finding the first or last granule, as well as reading or writing a sector. Browsing through the file is done with the arrow keys. You can go forward or backward by sector or granule, with the print function being available at all times. When the MODIFY sub-command is invoked, the screen display is broken into two halves. The top of the screen displays the data in ASCII and the bottom of the screen displays it in hexadecimal. When modifying data, you can do it in either ASCII or hexadecimal. The very bottom of the screen always displays the track and sector numbers that you are working with. This command is very handy when working with files, since the program will automatically find them for you.

The DISK ZAP command is very similar to the FILE ZAP command. It, too, presents you with a sub-menu. The difference here is that you are working with the disk as a whole, and not on a particular file. This menu also contains the LOCATE function which allows you to find all the occurrences of an ASCII or hexadecimal string on the disk. You might be wondering why the DISK ZAP command is included in the program. After all, the sub-commands available are essentially the same as those of the FILE ZAP command. After pondering this for a while, I realized that this would be the only way to get at the directory or the file allocation table, since they cannot be accessed by file name.

The READ and WRITE SECTOR commands are pretty self-explanatory. You can read any sector on any drive, and then write it out to any sector on any drive. The interesting thing about these commands is that you can read and write more than one sector at a time. With 32K, you can read or write up to 92 sectors at a time.

Although you could have a lot of fun zipping (or should I say zapping) through your disks, *Super Color Disk Zaps'* strength lies in fixing disk problems. The VERIFY command will find the error, but what if the error is in the directory or the file allocation table or smack in the middle of your basic program. How would you go about fixing it? Here is where the documentation (52 pages worth) comes into play. Needless to say, it fully describes all of the commands and how to use them. The section of the documentation which discusses "Zapping Techniques" goes a long way to help you in fixing your disk problems. This section alone is 19 pages and covers such things as the disk structure, dealing with the various types of errors, reallocating a granule, fixing a tokenized basic program, rebuilding files and tracks, and recovering KILLed files. I found this section of the documentation to be very informative, and even learned a few things about the disk system. The program comes on a protected disk which you cannot copy or backup. Normally this would be a problem, but since you also cannot write on the disk, the chances of wiping it out are slim at best.

By now you might be asking yourself "What can't *Super Color Disk Zap* do?" Well, so far I have been unable to get it to shovel my driveway after the blizzard we just had here, and it also would not print the disk directory on my printer. *Super Color Disk Zap* is an excellent, well written, and well documented disk utility. If you are at all serious about your disk system, this program is a must. Mr. Tim Nelson, the author, is to be congratulated on a job well done.

(Nelson Software Systems, 9072 Lyndale Ave., So., Minneapolis, MN 55420, $49.95 disk)

—Gerry Schechter

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Software Review . . .

Robots Maneuver Humans Into Programming

My sons, Peter and Andrew, are 13 and 11 respectively. At this stage in our family's involvement in computing, the main intrigue for them is, of course, the arcade-style games they can play. I'd love to have them learn something about programming—after all, one of the reasons this creature with all its paraphernalia occupies one side of the living room is that they need "basic computer literacy" in order to grow into the world they will eventually inherit.

What does this have to do with *Robot Battle,* a new piece of cartridge software from Radio Shack? Well, *Robot Battle* popped into my life at just the right time to serve a particular need. I was looking for a language or operating system for my 32K Extended 80-C that would be easy and intriguing for the kids, and teach them some principles of programming. Quite frankly, I ended-up ruling out Color Logo, an otherwise reasonable choice for a couple of reasons: first, being able to draw on the screen with Turtle Graphics is not a motivating factor, if you have several other graphic programs in the house that take less effort. We have *Art Gallery* and *Microprinter (Radio Shack), Semi-Draw* (Computerware), and the *XPAD.* Oh yes, and Chromasette Magazine with *DRAWER.* See what I mean? The second reason I didn't choose Logo as a learning language for the kids is that the drawing-on-the-screen motivation is also a little bit above their age level. (It's not above mine, but that's another story.) Game playing is what they're "into."

Now we get to *Robot Battle* (Subtitled "Adventures in Programming"). The program presents two tank-like robots (one red with a blue gun, the other blue with a red gun) on a black field. At the bottom of the screen are a blue and red line indicating available energy for each robot. The user's objective is to *write a program* for his/her robot that will help it win against the other robot. Both robots need programs, so the game works best if it's played with two players. But, there are demonstration programs for both robots, either of which could be retained to do battle against. You could also use the same program for both robots—at least that way they would be evenly matched.

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There is a full-screen editor for entering/editing your programs. It's a little hard to adjust to having the arrow keys move the *text* up and down rather than moving a cursor, but that's the only drawback to the editor. After creating a program, you return to the beginning menu, from which you have these options: NEW, EDIT, SAVE, LOAD, COMPILE and BATTLE. For each option, there is a corresponding command for either left or right—except BATTLE, which obviously involves both robots.

The "language" you need to master in order to write your robots' programs is remarkably Logo-like. In fact, *Robot Battle* might be suitable as a stepping-stone into deeper waters such as *Game-Writer* or *Logo.* The language of *Robot Battle* is also very easy to learn. Testimonial from my 11-year-old: "This is *easy* to program!"

There are directional movement commands (F,B,R,L,H) for *forward, back, right, left,* and *halt;* "T" for *turn* a certain number of 45-degree units and "D" for facing a particular *direction*; "M" and "L" for your two weapons, *missles and lasers,* with "X" for *execute* one of them; "= for "*if true* and "#" for *if not true;* a random function, "?," to have some portion of a program occur only every once in a while; and searching abilities with "S" for *anything at all in any direction* or "=M," *if missle*; "=R," *if robot* "=R," *if robot*; "=W," *if wall* for the particular direction the robot is facing. "#M," "#R" and "#W" mean *if no missle, if no robot* and *if no wall.*

At the simplest level, programs can be entered one line at a time (no line numbers are used). Multiple commands on a line are separated with a colon. The program will automatically cycle back to the beginning when executing. There is, however, a more sophisticated approach available: the use of labeled subroutines. You can use any word you want as a label, as long as it doesn't exceed six characters. The definition of a procedure follows this syntax: LABEL, "greater-than" symbol, space, then a string of commands. Once you have created a few subroutines, they can be called with C (like *GOSUB* in BASIC) or jumped-to with G (similar to *GOTO.*

One really fantastic aspect of *Robot Battle* is that the language is fully *recursive* and *re-entrant.* "What's that?" you ask. It means that you can get into some pretty sophisticated programming structures by having a procedure *call itself!* The sample programs included here (for robots named *Fred* and *Irving*) don't make use of this, but recursivity helps in creating extremely *intelligent programs.*

```
*FRED
ROB> =R:XL:CMIS:CRAND:GROB
WAL> =W:T5:F4:CROB:GWAL
RAND> =?:T2:F8
LOOK> =S:T1:CROB:CWAL:GLOOK
MIS>  =?:XM:CDLAY
DLAY>  B2:F3
START> CROB:CWAL:F8:=?:T1
CLOOK
=?:T-2
GSTART
```

A WORD FROM THE SPONSOR

Welcome to the fourth of my monthly chats with readers. Judging from my mail, this is proving to be a popular feature of our Star-Kits ads.

How often have you wished that you could see a program work before you bought it? We have come up with a way for you to do just that . . . if you have a video cassette recorder.

To show you what our programs do, we have prepared a demonstration tape which puts each of our programs through its paces so you can see exactly what it does and how. We're not professional movie producers so it's not quite up to Hollywood standards, but it does provide a complete and thorough demo of each of our programs, better than you might get in a computer store.

The tape is available in either VHS or Beta format and costs $20. If you return it, you get full credit toward any purchase. If you decide not to buy our software (not too likely once you see it work), then just erase the tape and reuse it.

Another way to evaluate products is through magazine reviews. Here is a listing of recent reviews of Star-Kits products: HUMBUG — Color Computer News in February 1983, Rainbow in May 1982, and 68 Micro Journal in June 1982. STAR-DOS — Rainbow in February 1983, and 68 Micro Journal in January 1983. SPELL'N FIX — Rainbow in July 1982, 80 Micro in November 1982, and 68 Micro Journal in July 1982. NEWTALK — Rainbow in June 1982. You will also find reviews in MICRO Magazine, InfoWorld, and elsewhere.

Here's a note to HUMBUG owners. If you are using HUMBUG with a disk system, then single-stepping or breakpointing a program may occasionally prevent Basic from turning off the disk motor. To avoid the problem, change the five bytes beginning at location 3B1A from 10 EF 8D 03 CB to A6 E4 1F 8A 12. HUMBUGs shipped after February 1, 1983 already have this change made.

One of our customers bitterly complained the other day — in fact, accused us of fraud — for shipping him Spell 'N Fix on a copy-protected disk, but not mentioning it in our ads. After taking umbrage at his letter, I decided to devote part of this column to the subject.

We all know that "lending" programs among friends is common. It's difficult to say "No" to a good friend. The problem is that some people can't even say "No" to strangers. I've recently come across a salesman in a computer store who is giving away commercial programs to total strangers just so he can sell more computers. I have also seen a computer club send out a list of "free" software by mail just so they can sign up a few more members.

Consequently, most software houses now copy-protect their disks or tapes. We do it with Spell 'N Fix, and so do most of the other major software houses that advertise in this magazine. Frankly, it costs us time and money to do it, and we don't enjoy it. Yet we have to. People who would never steal a $70 watch don't hesitate to steal a $70 program. Believe me, from the victim's point of view they both hurt equally much.

Maybe we all need a little more practice saying "No!"

After all, if God had meant to endorse this kind of thing, He would have given us the Ten Suggestions.

See you next month.

Peter Stark

SPELL 'N FIX

Regardless of whose text processor you use, let SPELL 'N FIX find and fix your spelling and typing mistakes. It reads text faster than you can, and spots and corrects errors even experienced proofreaders miss. It is compatible with all Color Computer text processors, including Telewriter and Radio Shack's Scripsit! (See the review in 80 Micro, November 1982.) $69.29 in the Radio Shack disk or cassette versions; $89.29 in the Flex version. (20,000 word dictionary is standard; optional 75,000 word Super Dictionary costs $50 additional.)

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A Disk Operating System specially designed for the Color Computer, STAR-DOS is fully compatible with your present Color Computer disk format — it reads disks written by Extended Disk Basic and vice versa. But with STAR-DOS you can use machine and assembly language programs to do things Basic can't. Just $49.95.

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PEEKS AND POKES

Hello again. This month we'll have some more on peeks and pokes, but first the commercial. By the time this ad hits, ZAXXON will be available for the CoCo, and PCLEAR 80 will have it. Call or write for details.

One excellent use of PEEK is to find the addresses of machine language programs. PRINT PEEK(157)*256+PEEK(158) to get the start location; PRINT PEEK(487)*256+PEEK(488) to get the beginning; and PRINT PEEK(126)*256+PEEK(127) for the ending.

To save wear and tear on your on-off switch, type POKE 113,0 and press the reset button. This will give you a cold-start.

We went to this type of ad this month because we thought that you, like us, get tired of seeing endless lists of software. And, frankly, we're too small to compete with the folks taking out full-page ads and offering glossy catalogs . But we can offer you one thing--total dedication to the Color Computer and CoCo owner.

And we do have a fine list of CoCo products to choose from, including DONKEY KING, TELEWRITER, PLATINUM WORKSAVER, and the only under $200.00 HARDWARE speech synthesizer available anywhere. We also stock many back-issues of RAINBOW.

So order from our Feb. ad or send $.50 for our full catalog (refundable with order). And look for our ad next month for some more PEEKS and POKES.

Special thanks to the International Color Computer Club who provided much of the info on PEEKS & POKES.

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```
*IRVING
ROB> =R:XL:CMIS:CRAND:GROB
WAL> =W:T -5:F8:CROB:GWAL
RAND>  =?:T-2:F6
LOOK>  =S:T-1:CROB:CWAL:GLOOK
MIS>  =?:XM:CDLAY
DLAY>  B1:F1:B1:F1
START> CROB:CWAL:F8=?:T-2
CLOOK
=?:T2
GSTART
```

The main loop of the program begins at START. Here's a translation of Fred's main program loop: Call ROB, call WAL, forward 8, once-in-a-while turn 45 degrees right, call LOOK, once-in-a-while turn 90 degrees left, then return to START. All the searching and firing of missles and lasers is embedded in the sub-routines.

When you've edited a program and are ready to see it operate, you must have the computer *compile* it. Compiling is almost instantaneous. When you call BATTLE, your robots will be ready to go at the touch of a number key. Which key you touch will determine the speed of execution of your programs. A number 1 is the fastest available speed, while #9 is an absolute snail's pace. You can also single step through the routines by using the 0 key.

Considering that the programs are compiled, I'm surprised at the relative slowness of movement, even at the "fastest" speed. It takes quite a while for a robot to use up his available energy (taking hits, firing weapons, bumping into things, etc., all use varying amounts of energy), leaving the other robot victorious. Two major things I'd wish for in this program: faster speed and an option to design your own robots.

The ultimate test is if the program is doing what I thought it would do when I bought it. Does it really teach programming methods and structures? I think so, but only time will tell. Does it intrigue enough to draw the kids to it? Well, in competition with *Donkey Kong* and *Defender* and *Centipede,* it doesn't stand too much chance, but the 11-year-old is a little more intrigued by the idea of learning programming than the 13-year-old video-game wizard is, and he *has* spent a couple of self-motivated sessions on it.

(Radio Shack, Nationwide, cat. #26-3070, $39.95)

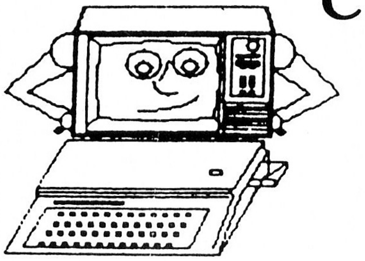
—Paul S. Hoffman

Hint . . .

Painting Must Be Accurate

When you issue a PAINT command, be sure that you set the point at which the PAINTing is to begin within the area that is to be PAINTed. If you set the position on a line which encloses the area, the PAINT will not work.

Also, when using PAINT, be sure that your area is fully enclosed, or the PAINT will "leak" out and cover the entire screen.



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10). FIND FRIENDS	As a new member, you will receive a list of the members in your area whom you may contact for CoCo talk.

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Write to the club for an application, there are no conditions for membership other than agreeing to obey the rules, being interested and paying the dues. The membership dues are $30.00 per year and we believe you get more than your moneys worth. You can save more than the $30.00 in discounts the club offers you. Example: Subscription to the RAINBOW, 25% off of regular subscription rates. Some members have told me that the new member tape alone is worth the $ 30. it contains 10, very good programs. Some of the programs contained in the library are, Accounts Receiveable, General ledger, Inventory, Sales file and ticket program with automatic Inventory update (for 32 K with 2 disc.)

VISA MasterCard

Shark Treasure: Unique, Challenging Graphics Game

Not too long ago, obtaining software for your CoCo was easy. You either bought what little there was available, or you wrote your own. These days, you not only have your choice of programs, but you very often will have to decide which version of a program to buy. In fact, some new programs today are just another version of an existing program. This is not a bad situation, because competition is good, but it does make the job of deciding which programs to buy a little more complicated. Every now and then, a program comes along that does not resemble an existing one.

Shark Treasure is just such a program, and although the main theme is to stay alive, this is where any similarities end. The scenario is as follows. You have just found a long lost galleon, which was sunk hundreds of years ago. Its cargo includes millions of dollars worth of gold and jewels. All you have to do, is to send your divers to the ocean floor in order to recover the fortune. The only problem is that the waters are infested with huge man-eating sharks. Your divers have flash grenades for protection, which will temporarily scare the sharks away. However, they can only carry three grenades and/or treasures at the same time. This is where strategy comes into play, because if you have three treasures with you, you will have no protection on your way back from the ocean floor.

When the game starts, there are two sharks in the waters, and there are five treasures on the ocean floor. At first, I thought that the game would be a cinch. The two sharks were moving nice and slowly, and it appeared that I could easily get by them. Boy, was I ever wrong! As soon as you get near a shark, it quickly lunges towards you, and you have lost your first diver. This threw my timing off right from the start. Setting off one of the flash grenades does scare the sharks away for a while but here, too, the timing must be right. Each time you recover the five treasures from the ocean floor, another shark appears, up to a maximum of six. Dealing with two to four sharks is easy, once you get your timing right. Getting past five sharks is really tough, and getting past six of them requires precise timing and strategy. Once you get past the six sharks, they change their swimming patterns and speed. This throws your timing off again, and makes the game a real challenge.

Shark Treasure is a fun game that will give you a break from blasting 'invaders' and the like. If you are looking for a game that is unlike any other, it will make a good addition to your library.

(Computerware, P.O. Box 668, Encinitas, CA 92024, $21.95 tape, $26.95 disk)

—Gerry Schechter

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TURN OF THE SCREW

How To Reduce That RFI On Your Monitor

By
Tony Distefano

First of all I would like to clear up a problem with the "Finger Saving Rapid Fire Circuit." The potentiometer in the Parts list has the wrong part number. It is not *the Rainbow's* fault, it is mine. You see, when I first made this circuit, it was indeed a 100k ohms pot, like the part number stipulates. But I thought the firing speed was not variable enough, so I changed the pot to 1 Mega ohms. If you have already bought the 100k ohms pot, do not despair, it will still work. The only difference is that the firing speed will not go as slow as the 1 Mega ohms one will. Radio Shack does not have a 1 Mega ohms pot in that package, so I cannot give you another part number for it. Almost any other electronic hobby shop should have it, though.

Okay, let's get on with this month's project. One of the problems with some of the older Color Computers is that when you plug in a disk drive, you get a lot of noise on the screen. The type of noise I am talking about is not a buzz from the speaker, but a type of wavey, herringbone pattern that seems to swim across the screen at a regular rate. Yes, that is "RFI." That stands for Radio Frequency Interference. I talked a little about RFI in the January '83 issue of *Rainbow*. It is very annoying to see this noise going back and forth on the screen all the time. Fortunately, there are a few things you can do to eliminate it.

One of the things you can do is this. Open the door and look inside the cartridge port. On both sides of the connector there should be metal clips. If there aren't, your local Radio Shack Repair Center can put them in for you. Apparently they will do this at no charge. I guess you will have to find this out for yourself. What this does is, when you have a disk controller plugged in, the clips act as extra ground connections. This prevents the controller from acting like an antenna.

Another way to reduce the RFI in the Color Computer is to get the aluminum shield from Radio Shack (again!). This shield fits under the keyboard. It snaps into the main board between the plastic standoffs and the board. The rest goes under the keyboard without any other connections. This extends the ground plain that is under the main board to the keyboard, too. The third way, and the main topic of this month's article, is to modify the TV that you are using with the Color Computer.

Before you start digging into your TV set, I'll give you a little background on how the signal gets from the Color Computer to the tuner. It starts from the connector in the back of the computer. It then goes down a shielded piece of wire to the connector box supplied by RS. This is a switch box which allows you to connect your antenna to it and switch back and forth between regular TV signals and the computer without disconnecting anything. THIS BOX IS A BIG SOURCE OF NOISE! Get rid of it immediately! RFI can seep through that box like water through a screen door on a submarine. It is best to get rid of the wire that RS supplies too. You must make your own wire. This is not hard. Buy the four-foot white coax cable from RS part #15-1529. On one side, push on one of the F-56 connectors (supplied with the kit). On the other side install a Shielded Phono Plug, RS part #274-321. That is the end that goes into the computer. If your TV set has only the two screw type terminals you will need a F-61 connector as well, RS part #278-212, (more on that later).

So far, what you have done should reduce the RFI by quite a bit, but if there is still RFI coming in you must modify the insides of your TV. The next step requires that you remove the back of your TV. Only experienced hackers should take off the back of a TV. There are high voltages present in there. If your TV is like mine and most TV sets, the antenna connections are done via a small circuit that isolates the ground of the TV to the antenna. This is done to prevent electric shocks, because since there is no power transformer, one side of the AC line is directly connected to the internal ground. Touching the ground of the TV is like touching one side of a plug. Nothing will happen until you touch a ground point like the third pin of a three-prong plug or a water pipe. The Color Computer is grounded with a three-prong plug. If you try to connect them, watch out. Then you will see all the sparks fly. This is why the manufacturer of the set put a high impedence circuit to isolate the line from the antenna input. A small circuit is a lot less expensive (and a lot lighter) than a power transformer. Unfortunately this circuit is very sensitive to RFI. You have to remove this circuit and connect the antenna terminals directly to the tuner.

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RAINBOWfest

april 22-24, 1983

CoCo's Very First Show!

CoCo has grown up and it's time for CoCo's very first show. Sponsored by *the Rainbow*, the premier magazine for the TRS-80 Color, TDP System-100 and Dragon-32 computers, RAINBOWfest will be *the* place to be this Spring.

Exhibits will abound. Information will flow. New products will be shown and introduced. Many of the "names" in the CoCo world will be in attendance. It all boils down to three days of fun, excitement and learning for everyone lucky enough to own a CoCo (or those who just wish they did)!

The place is the Regency-Hyatt Woodfield, located on the western outskirts of Greater Chicagoland, within easy access to highways and O'Hare International Airport.

The dates are April 22-24.

The times are 7-10 p.m. Friday; 9 a.m.—8 p.m. Saturday; and 10 a.m.—5 p.m. Sunday at the Grand Ballroom.

The cost is only $7.50 for a three-day ticket in advance or $11 for a three-day ticket at the door. One-day tickets are $5. in advance or $7.50 at the door.

A Saturday "let's make friends" breakfast is also planned. Cost of $10 includes breakfast and a speaker—someone well known in the world of Color Computers.

Rooms are available at the Regency-Hyatt Woodfield for a special RAINBOWfest rate of $43 per night, single or double occupancy.

Admission tickets, breakfast tickets and reservation cards for the hotel can be secured directly from *the Rainbow*. Mail the form below to *the Rainbow*, P.O. Box 209, Prospect, KY 40059. Advance sale tickets will be sent by return mail up until April 15. After that, they will be available at the door.

Oh yes...for the "others" who (perish the thought) don't get into CoCo like you do, Woodfield Shopping Center directly adjacent to RAINBOWfest is the world's largest enclosed shopping mall. And, you are only a short drive from downtown Chicago's museums, theatres, aquarium and shops.

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Advance Sale ends Thursday, April 21. Orders sent after April 15 will be refunds on tickets.

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The first thing you must do before you take out the circuit is to add in a transformer to isolate the line. The transformer must be a *line isolation transformer*. Your local electronics-store should have one. The power rating of the transformer must match the power rating of your TV. It is usually written on the back of the set, or in the operating manual. Now, remove the back from the TV and mount the transformer somewhere inside, with the proper mounting hardware. Cut the AC cord that runs inside the set. If your set has a removable cord, cut the wires from the internal side of the connector. Re-route the AC side of the two wires to the input of the transformer and route the output of the transformer back to the TV input. This will isolate the ground from the Ac line. I cannot emphasize enough the need for this transformer; if you don't put it in and you remove the circuit, you stand the chance of burning out your TV and your computer. Then you won't have to worry about RFI, only fire. Enough of this, now it's time to remove the circuit.

Unsolder the circuit from the antenna terminals. If the terminal is not the cable TV type, drill a hole and mount the F-61 connector. The other side of the circuit is usually a shielded wire that leads to the tuner. Cut the wire as close to the circuit as possible. Strip off the insulater and solder the inside wire to the tip of the F-61 connector. Solder the shiled part to the outer part of the connector. This will connect the antenna terminal directly to the tuner input. Before you plug in the TV, a little check is in order. With an ohm meter, and the TV on (but not plugged in) measure the resistance between the AC cord and the antenna terminal. Test both wires. If they read high impedence you are in business, if not, then check the wiring again. There should be no shorts between the AC cord and the antenna terminals. Replace the cover and try it. There you are, a clean picture.

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Software Review . . .

Bridge Tutor I: This Partner's No Dummy

Bridge Tutor I is one of the latest offerings from Radio Shack in the ROM Pak department. As a former grand master of the lunch players bridge society, I was very interested to see how I could do against a computer. Well, we'll get to that later.

Bridge Tutor I comes with an 83-page instruction manual which makes the package somewhat larger than the standard ROM Pak. The documentation is well written and in a very well organized format. The manual is divided into four sections. The first section tells you how to use the program. The second part provides a comentary on each of the 100 pre-programmed hands. The third sections covers the fundamentals of bidding and playing for novices. The fourth part is a summary of operations of keys. No problems were encountered with the program, but it is complicated enough that you must read the first section of the manual to become familiar with the operation.

The program will run on a 4K non-extended basic computer. Joysticks are optional.

After inserting the ROM Pak and turning on the computer, you will see a logo of the hand you are playing. The hands are numbered from 1 to 100 and arranged in order of increasing difficulty. Each hand is supposed to offer a unique offensive or defensive strategy. The arrow keys control the majority of functions, or the joysticks if you desire.

After picking the hand of your choice *ENTER* will initiate the dealing of the cards. I think this is a program in itself in that the cards are dealt into four separate hands and *the player's hand is sorted for him* according to suits and rank.

The bid is increased by "up-arrow" until the bid of your choice is selected by *ENTER*. An incorrect bid will be noted and not accepted.

The following keys have special functions: "A"-advice, "F"-fast deal, "S"-score, "R"-review, and "J"-joystick.

After the bidding is completed, you are given the choice of which hand you wish to play. The game starts automatically unless you are in the west position, in which case you have to lead.

Play is continued by picking the card of your choice by means of the "left-arrow/right-arrow." Incorrect plays are noted and you are also congratulated for "crucial play." You are scored at the end of each game for the percentage of correct plays.

The only problem I had with the program is that it wouldn't let you make a mistake. As in most everything I do, I have my own way of playing bridge. It must be somewhat unusual, as I had several occasions where I disagreed with the *Bridge Tutor I* "expert." My neighbors have a competitor's version of bridge and it doesn't comment on the hands, letting you fend for yourself. Fixed bidding, as in *Bridge Tutor I,* is a big advantage for the novice but somewhat frustrating for the advanced player. Maybe that's why they named it *Bridge Tutor* instead of Bridge Expert!

In conclusion, I think the game is fun and interesting. I recommend it to novices and experienced players alike. Now, if only they would add a synthesized voice that shouts "what a play!" or "you dummy!"

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—Dan Downard

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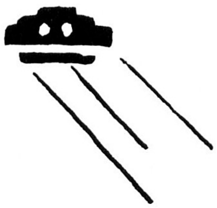

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Software Review . . .

Death Star: Recommended Adventure, Impressive Package

You are the rebel fighter given the task of rescuing Princess Leah from the *Death Star*. This one-player Adventure gives you the choice of either novice or pro modes (advice: novice is playable while pro is guaranteed death even for an experienced adventurer).

This 32K Extended Color BASIC text Adventure is a nice introduction to the logic and flow of an Adventure game. It is Carl Shell's first attempt at this type of program. The flow and play of the game is adequate, but it lacks some of the frills of the very best advanced games. The following critique is designed both to give a description of the game and to give guidelines to players who would like to edit the program to suit their own tastes.

Death Star uses Sugar Software's *Auto Run* to create an appealing title page. After this, however, expect mostly text and a few screen color changes. Along with graphics I should mention the sound effects. The sounds are pleasant at first, but soon become annoying. They remind me of a Navy alarm buzzer.

The game package includes one program tape, one page of hints, and one page of instructions (no more instructions are needed since the program is self-explanatory). The 5½" x 8½" hard vinyl case which stores all of this is very impressive. It is more appealing to look at a nicely designed case than a mere cassette box lying on my desk. It adds a touch of professionalism to my library.

The object of your mission is to find the power pak, rescue Princess Leah, and then find the escape module. You have eight enemies (four are weak and are used to gain credits, while four are strong and are used to hold the princess). The power pak and escape module are just lying around. All you tumble upon these. Rescuing the princess is another thing. You to do is to smust defeat the hard foe who holds her captive; however, you do not know which one has her. After you find the power pak, rescue Princess Leah, and find the escape module you have finished the adventure.

In the novice mode, you start with 1,000 credits, 300 hit-points, and 50 units of oxygen. You use your credits to buy weaponry, armor, more oxygen, and hit-points, and various forms of help from Yoda. Don't expect to buy everything at first. You must wait until you do battle and earn more credits. You can earn hit-points by spending a few nights at the sleep port.

The first thing you should do after arriving at the teleport gate is visit the weaponry shop. While there you should purchase a gravity pak and a weapon. Your choice of weapon is not important as long as you also buy the enhanced weaponry capability from Yoda (hint from Yoda: Do not trust your impulses. Trust the force). Next is armor. Use your own discretion when buying armor. Enhanced armor is nice, but not mandatory. It is very helpful if you seek help from Yoda. You can purchase potions to prevent blindness, sleep, poisoning, and in some cases, body damage. You may also buy a favor from Yoda to collect upon when a tragedy befalls you. (A "favor from Yoda" can turn a sure mortality into a good laugh. A nice touch!) As for the extra oxygen and hit-points, all that can be said is to obtain these when you think that you need them. After you play a few times you will find a combination that you like best.

The logic of the game is very simple. Single alphanumeric character inputs control all movement and actions. This feature makes the game easy enough for children, but in long play, it can become repetitious. No map is needed since there is not a pattern of events set by the program. Random numbers control the play of the game. If Lady Luck is not on your side, you could be searching for hours before you would find the things you need (here's where you will wish that you did need a map). I suggest that if play lasts longer than two hours, start over. If you need help, Carl Shell very generously offers his phone number in the documentation, suggesting you call him between 6:00 p.m. and 11:00 p.m.

In conclusion, I recommend *Death Star* to either gamers who have never played adventures before or to more experienced players like myself who would like to edit and adapt a BASIC Adventure to their own tastes.

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—John R. Curl

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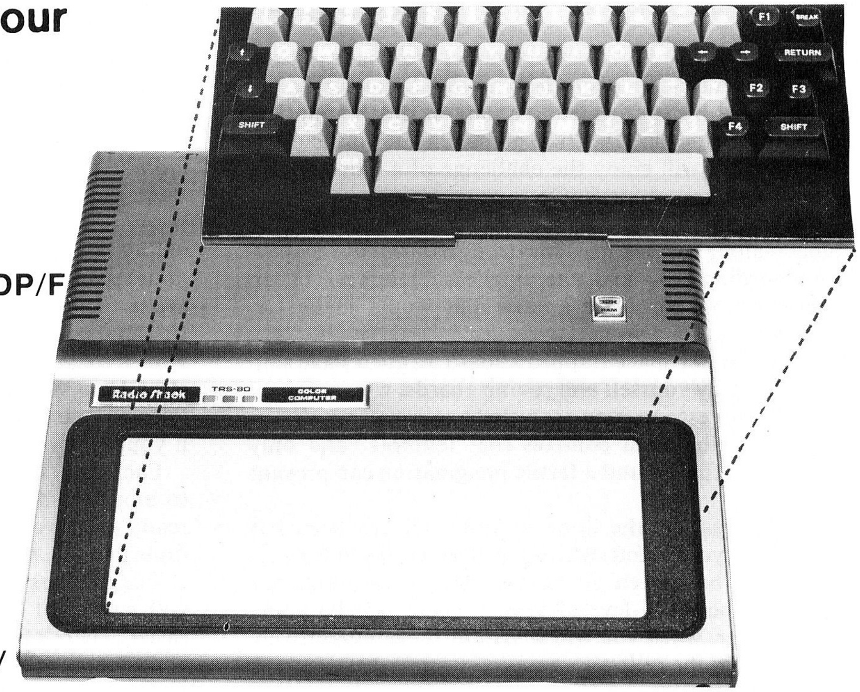
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Software Review . . .

Beware of the Fembots
Beyond the Cimeeon Moon

If you're a novice at Adventure games, you have to have suicidal tendencies to play *Beyond the Cimeeon Moon* because you will experience the agony of death countless times. The advanced Adventure game player, on the other hand, probably will enjoy the challenge of a game that is breaking new ground for CoCo.

The game combines the magnetism of colorful arcade-like graphics—along with the need for strong hand-to-eye-to-keyboard coordination—and the intellectual appeal of an Adventure game to create a saga that would make Dr. Spock break out in a sweat.

You are in outer space trapped aboard an alien slave ship occupied only by yourself and roving guards, who are there to prevent your escape. You are pitted against an omnipresent machine mind that controls the "fembots" and only rapidly typing fingers and a fertile imagination can prevent your demise.

For some reason, the door to your cell has been left unlocked and your mind, which has been enslaved for several years, has been freed, so there is finally a remote chance of escaping the multi-leveled vessel. There will be many times, however, when you will yearn for the comparatively safe confines of the cell.

You quickly discover that the halls are being patrolled by fembots and they show up when you least expect them. Sometimes they zap you before you've even seen them. Then there are times—if you can type quickly enough—when you can run right over them, a fact I discovered out of desperation.

A rich assortment of basic necessities have been left behind by the aliens, including such things to wear as vac-suits, armor, powersuits with armor, and shield belts—which can be found throughout the ship if you search long enough. There also are such weapons as lasgun lasers and mauler rifles, which have been slipped into out-of-the-way crannies, as well as some disc decoders.

As you "tour" the ship you will discover that there are many mysterious rooms—a number of which appear to be empty at first glance, but which contain items essential to your escape, if you know how to search them. Many of them are in fact empty but, upon entering them, you're likely to find that someone or something has locked the door behind you. Don't panic, though, because pressing the shift and clear keys simultaneously, along with any other key, will teleport you back to your cell. (You will discover this early, if your experience is similar to mine.)

Each floor contains teleportation pads which enable you to move from one floor to the next with relative ease. Be ready to move quickly, however, when you get to the next floor because the fembots are everywhere.

The creators of the game are kind enough to provide you with a series of 11 commands that should make playing a lot easier. There's an "inventory" command that lets you check your energy supply and the equipment you have picked up along the way. Your energy supply dwindles every time you are shot, but you can be shot eight times before it's used up and you are wasted. Thankfully, there are places in the vessel where you can have your energy restored.

Enter a wrong command and all you get is an "Oopie!" or "Error" message. I think the "Oopie" signal is supposed to add a little levity, but I didn't think it was so funny after seeing it more than 50 times. Nor did I enjoy the hundreds of trips I made up and down the halls searching for the faintest clue of a solution to the game.

I was impressed by the three-dimensional graphics and the surrealistic sound effects. You do get the feeling of actually being inside the spaceship and it is not difficult to find your way around using the arrow keys. I also liked the window I found on the third floor of the ship; it was refreshing to see the stars twinkling after so many blank walls and empty rooms.

There are many solutions to the game and, if you're among those lucky enough to find a couple of them, you're ready for some of ColorQuest's other 3-D games, such as *Fembots' Revenge* and *Adventure Trilogy*. If you are smart enough to solve *Beyond The Cimeeon Moon,* that is. On a scale of 1 to 10 in Adventure games that I have played, I would give this one a "nine."

If Adventure games are your bag, *Beyond The Cimeeon Moon* is for you. Now, where is that leader. . .?

(ColorQuest, a division of Softlaw Corp., 9072 Lyndale Avenue South, Minneapolis, MN 55420, 16K tape $24.95, 32K disc $29.95)

—Charles Springer

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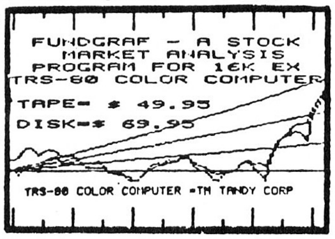
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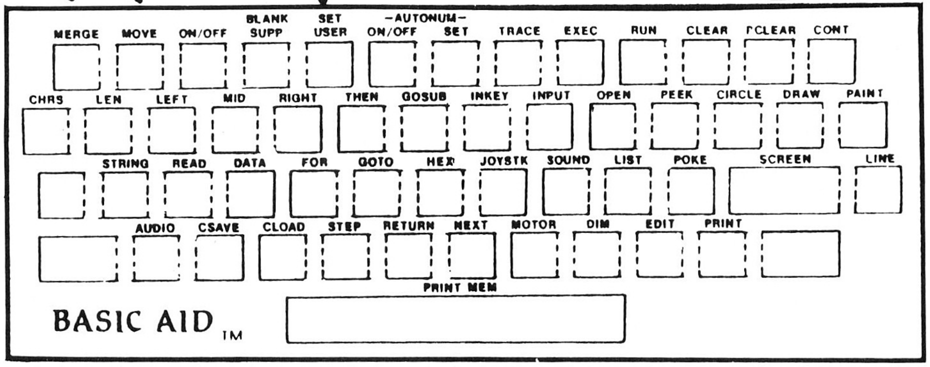
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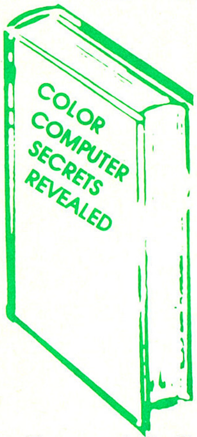

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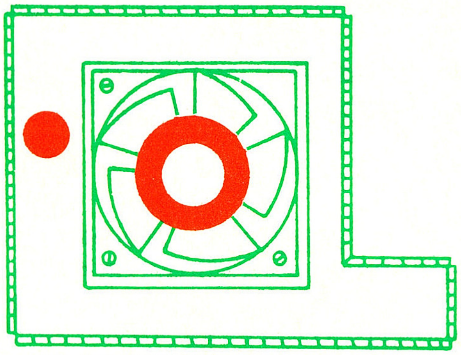

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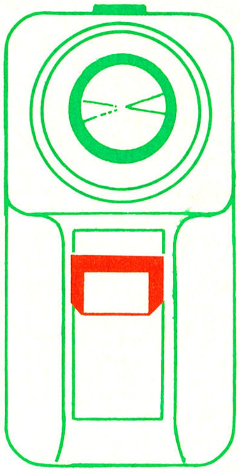

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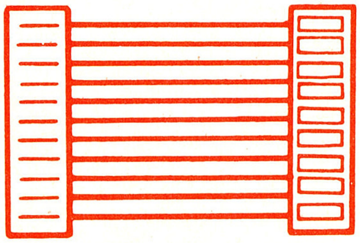

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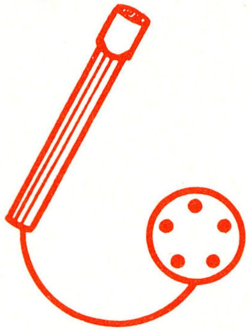

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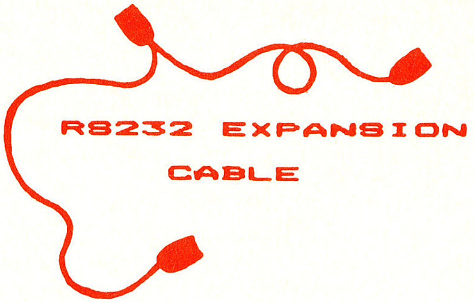

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Software Review . . .

Synther-7 Creates A Symphony for CoCo

When was the last time you had a chance to play a Hogfife or a Krumphorn? Have you ever gone to a late-night jam session, only to realize you left your Jninni at home? Well, thanks to Computerware's *Synther-7* program, you'll have these instruments, and more, right on the keyboard of your Color Computer.

Synther-7 is a real-time musical synthesizer which is totally controlled by software. It enables you to generate musical notes and sound effects from designated keys on the computer. These sounds can be modified by several parameters before they wind up on your TV's audio speaker or cassette's audio input. Because the sound is routed to the AUX jack, it enables you to record your works right onto the cassette recorder, or for that matter, any recording device at all.

The machine language cassette version loads and automatically executes from tape with one *CLOADM* command. It comes with six pages of easy-to-understand documentation, the last page being a summary of all the commands. It was only a matter of a few minutes before I was creating masterpieces on my new "instrument."

Upon loading, the top of the screen will show a picture of a piano keyboard (two ocatave's worth) and the corresponding keys on the computer which activate them. The "QWERTY" row, including the up-arrow key all the way to the *CLEAR* key, represent the white keys of the piano. The number row, from "1" to the *BREAK* key, corresponds to the black keys (sharps and flats) of the piano. While this takes some getting used to, Computerware suggests marking the keys which sound notes with cellophane tape. A keyboard overlay of some sort might have been nice, but it wouldn't be difficult at all to make one. I plan to do so, using the overlay from Radio Shack's *Art Gallery* program as a template.

Also pictured on the screen are a block of text labeled STOPS (the different preset sounds), a bar graph on the lower left which indicates the envelope of the sound, a block of text identifying different control keys, and a bar indicator of the current pitch range. As these choices imply, there are lots of ways to change the nature of sound, and the features of this program far exceed those of the regular *SOUND* and *PLAY* commands.

Rather than try to describe the sounds of the five presets, suffice to say they range from somewhat natural (Lute) to borderline bizzare (Krumphorn). Synthesists will be happy to know that you have full control of ADSR (attack, decay, sustain and release). Changing the values of these functions is achieved by hitting the appropriate keys (which conveniently occupy the third row of the keyboard). Furthermore, you can change the vibrato and volume, and even add twang and bend to a note. Try doing that when you start with Krumphorn as your basic sound! It's music from another planet!

Learning to use *Synther-7* is easy because the documentation takes you through an example of sound creation. I'm partial to documentation that serves somewhat as a tutorial because it cuts down on the time it takes to master different functions. With most computer programs, it's a matter of learning what keys do what, and learning by example is the best way.

After creating several different sounds (I even wrote a nice melody), I experimented with sound effects. It was relatively simple to create the sound of an ambulance siren (coming after *who*, I wondered). Then I wanted to see how long I could sustain one note. *Forever* seemed to be the top limit.

As a recording engineer and musician, I've been somewhat skeptical of the synthesizer capabilities of the 80C. This software program is well thought out, and can provide many hours of composition and experimentation with sound. "Ah, yes," you say, "but *how good* it is? Could it be used in a real recording situation, or is it more or less a toy?"

I first wanted to test the S/N (signal-to-noise) ratio of the sound output. Although I didn't have any real test equipment at home, I decided to record onto the cassette, simply to see what it sounded like. Playback seemed to contain some low-end rumble around 50 or 60 hz. But to be fair, I checked further to see whether it was the program or the tape recorder that was at fault. Using a "Y' adaptor (available at any Radio Shack store), I routed the sound output to my Technics tape deck. The playback was astonishingly clean-sounding over the whole frequency range, but I was further surprised by the decent reproduction of low-end sounds.

"What about the pitch?" you argue. I knew from the past that the *SOUND* and *PLAY* commands on the CoCo were not true-to-pitch. I checked *Synther-7's* notes against those on my Casio. Before you even suspect the accuracy of the Casio, keep in mind that it was turned by a professional piano tuner with high tech tuning equipment. I checked one against the other, and it was right on! (How did they do that?)

Overall, this is an excellent program, well-worth the list price. If there were one feature missing, it would be a save-to-tape for any sound creations you might want to have later. They suggest that you write these numbers down for future use, but I'm lazy, and besides, that's why I got a computer in the first place. But enough said, I'm going to lay down different tracks on my Teac Portastudio, another marvel of technology. I must not forget my Gamba.

(Computerware, Box 668, Encinitas, CA 92024, $21.95 on tape, $26.96 on disk)

—Bob Safir

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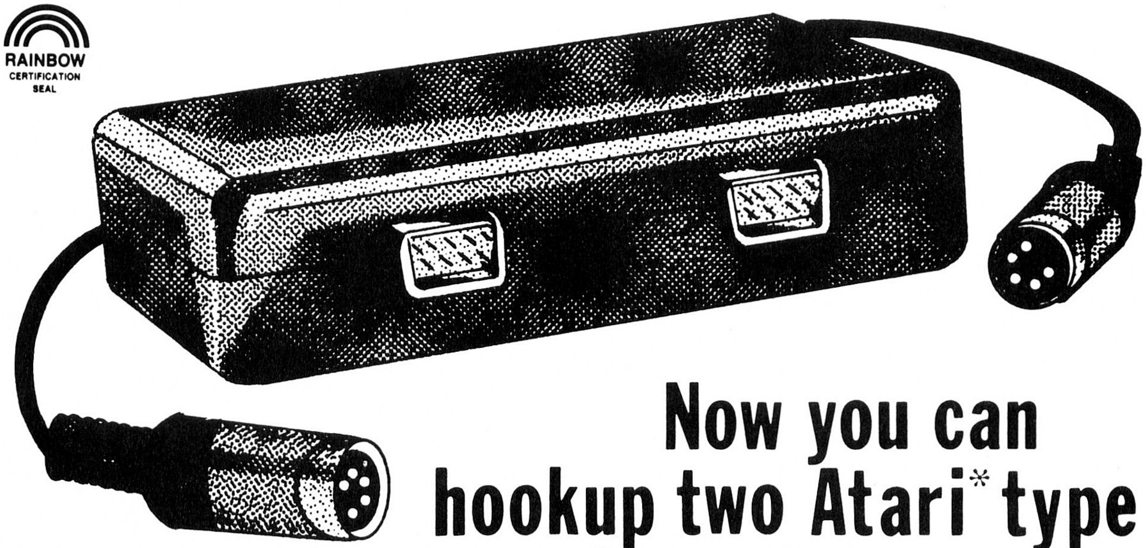

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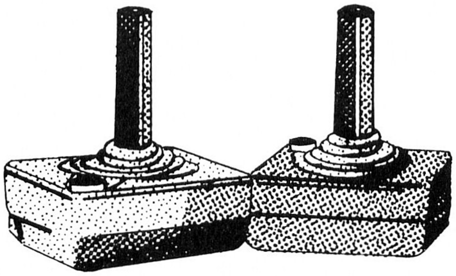

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PIPELINE

SOMETHING NEW IS just out from Radio Shack and, while it is not *strictly* for the CoCo, we think it is something you'll be interested in. It is called the TRD-80 Model 100 Portable Computer. This is a *true* portable computer with built-in functions such as an address file, a word processor and modem for communications. It even has a telephone dialer!

Most interesting of all, the Portable Computer connects easily to any of the other Radio Shack models — including, of ourse, our own CoCo. You can write letters and memos on a plane or while riding (but not driving) in a car and transfer files to CoCo as soon as you get back. Or, you can just call up your CoCo and dump information on the phone.

The Portable Computer comes with 8K, 16K, 24K and 32K. Starts at $799. The display is eight lines by 40 characters on an LCD screen. Go see it.

As you know, Radio Shack has introduced a number of new computers since CoCo. And, while we think the machines are good, none of them have had the personal appeal of CoCo. Until now. We're really enthusiastic about this new machine. In fact, we plan a new publication for it — *Portable Computing Magazine*. The first issue is due in July and there is a charter subscription rate of $23 until July 1. If you're interested, let us know.

WE FEEL IT IMPORTANT to call your attention to the latest issue of *TRS-80 Microcomputer News*and the comments made by Jon Shirley, vice president for computer merchandising for Tandy. Mr. Shirley talks about how some manufacturers "rate" the RAM available in their machines. Since you, as a loyal CoCo owner, might be questioned about this issue, we thought you might be interested in what Mr. Shirley has to say.

And, while he does not mention the Commodore 64, we will. Simply because we were at a friend's house the other day, and he showed us his new Commodore. "It has 64K," he said proudly. We PRINTed MEM, and showed him otherwise. Yes, it has 64K of RAM—just like CoCo does—but, of course, only some 32K is usable.

Clearly, we feel Radio Shack's policy of properly characterizing CoCo as a 32K machine is a more accurate description of its capabilities. And, of course, you know you can access all 64K of CoCo RAM.

* * * * * *

ARMADILLOS MOVE SLOWLY, but they do move. And, so, for Armadillo Software, which has a new address and a new telephone number. You can reach them at (512) 835-1088.

* * * * * *

IN THE "WE GOOFED" area is this footnote to the review of the light pen software for the Spectrum light pen available from Computer Island. The package of software *and hardware is available only from Computer Island. Spectrum Projects does not carry the software—but does have the light pen, of course.*

* * * * * *

HERE'S A BULLETIN: There are several new bulletin boards now in operation, devoted primarily to CoCo. Among them are:

One out of Tom Mix Software at (616) 364-4791. By the way, Tom Mix' *Donkey King* program has a new name. Its now known as *The King*.

If you want some southern flavor to your communications, try *Kaleidoscope*, a 24-hour BBS out of the middle Georgia area. Willie Bethay is SYSOP and you can connect up at (912) 923-4679.

Three bulletin boards at one place? Yes, that's what SYSOP Bob Rosen announces. He's added a third to the present Rainbow Connection. Call either (212) 441-3755, (212) 441-3766 or (212) 441-5719 24-hours a day, seven days a week.

Queens must be the bulletin board capital of the entire northern hemisphere. In addition to Bob's three, there is a new one based in that New York City borough called *CoCo's Nest*. It is open 24 hours a day and Arnold Schiffman is the SYSOP. Its run by Strictly Communications, Inc.

* * * * * *

IF YOU HAVE A cassette copy of *Spectaculator*, we understand that you can get it converted to disk. We've just heard this and have not had an opportunity to check it out, but we hear that Tandy will do it for you if you send the original tape to Fort Worth and ask.

* * * * * *

YOU MIGHT WANT TO CHECK the continuous checks which a firm called Synergetic Systems has developed. There is a program to go with it and we are told the package of program and checks can be purchased as a package for $59.95. The firm's address is 4715 Shepard Road, Mulberry, FL 33860. Phone is (813) 646-6557.

* * * * * *

GIMIX, WHICH IS A leader in 6809 products, has a new 6809 CPU Board and software package available. The new board is specifically intended for use with multi-user multi-tasking operating systems. The software, OS-9 GMX III, is an enhanced version of the OS-9 operating system which was written to take full advantage of the new CPU Board. Information is available from Gimix, Inc., 1337 W. 37th Place, Chicago, IL 60609, (312) 927-5510.

* * * * * *

EDUCATORS WILL BE interested to know that Radio Shack has announced a program called "America's Educational Challenge" for all elementary and secondary school teachers in the United States. The purpose of the program is to assist teachers to achieve basic familiarity with computers and their use in the classroom. Information on the program will be mailed this month to the principal of every school in the United States. Also included are free certificates for free classes in BASIC at Radio Shack's Computer Centers.

* * * * * *

A NEW LINE OF modems and "Speed Select" Modem I/O cards has been announced by Universal Data Research. The new modems are designed to connect any terminal or computer with telephone lines. More information is available from Universal Data Research, 2457 Wehrle Drive, Buffalo, NY 14221 (716) 631-3011.

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Software Review . . .

Humor, Good Graphics Make *Crystal Revenge* Sparkle

Crystal Revenge is a fine game by Tom Roginski. The premise is that you (former galastic imperialists from the Crystal World) have been driven back to your homeworld, where you are under attack by various races whom you had sought to bring under your "enlightened rule." You are a space sector defender, and must laser out attackers' ships, protecting cities and your supply dump.

The graphics are excellent. An arc of the planet, its several large cities marked on its surface, is at the right of the screen. You maneuver a laser firing ring, a sparkly affair controlled by the right joystick. You must lock on to the moving target before firing. Attacker ships advance one by one across the black of space from the left. A fuel bar across the top of the screen shows how much laser fuel remains.

Hits on your planet show on the homeworld and are recorded at the bottom right of the screen; attacker ships downed are recorded at the bottom left. There is a complicated point scoring system, providing different levels of points for ships hit from succeeding waves, as well as bonuses for conserving laser fuel, minimizing hits on your planet, saving cities, your supply base, and the homeworld itself. Point-scores are calculated and displayed after each game, and compared to previous high scores.

You play for a defined win, as determined by two menu-selected difficulty parameters. You can enter a previous high score at the beginning, or play against high score made in a particular series of games, so that although only one person can play at a time, a number of players can compete on scores.

The colors are excellent. Roginski has devised a method of controlling 4 colors in PMODE 4 which involves displaying two ships just before a game and asking you to indicate if the one on top is red or not. Your answer fixes the false colors throughout a game without use of RESET lines. Roginski says that "as a by-product of the way the false colors are set" red areas of blue ships (or blue areas of red ones) are "armored," and hits by laser ring locked onto these areas will not knock out the ship. Roginski is writing an article about his use and control of false colors in hi-res. I look forward to seeing it after this interesting tidbit. Though the "armor" may be making the best of a necessary consequence of the programming method, it provides one of the most frustrating—and fascinating—features of the game. You lock onto an advancing ship. You got it! You fire! Nothing happens, you hit an armored section! Tally Ho, to the chase again.

The ships themselves add a certain funkiness to the game. The first wave comes at you one at a time, straight across, a bit herky-jerky (emphasized by the sounds they make), but not really evasive. They are rather baroque, but definitely spaceships—fish-like shapes with armored dorsal and ventral turrets. Not so the succeeding waves. I can only describe those as "critter-like." They come at you hopping, bopping, twitching, hula-shimmying; to say their trajectories are unpredictable is an understatement. They don't have trajectories; they do war dances. Too, as they approach and skitter or scoot away from your firing ring, they sneer, jeer, fleer and Bronx cheer at you. When you get one, it shudders, heaves, changes colors, and disintegrates, singing a little deathsong of pathetic defiance (veh-ree organic).

You have to destroy 10 ships in an incoming wave, and from three to five waves to save your homeworld. This is quite hard to do, though Roginski has designed the game to be winnable at all levels. However, if your supply base is destroyed, your laser will not be refueled for the next wave, and you will confront those funky little dip-ships impotently, with a firing ring that will lock on but do no damage. You have only 30 shots per wave, so refueling is essential.

You can cheat a bit in this game. I always look for ways to do that, since it expresses my rebellion against arcade-style games. You can pause the action with "shift@" and get your joystick under control for moving rapidly into best intercept position.

When the planet-destroying number of hits has occurred, concentric circles of throbbing red radiation spread from the last hit zone to fill all of space. *Ciao*, Crystal World. Such is the fate of would-be enlightened rulers.

To fit the entire program into 16K, Roginski has made it in three modules. The first, with complete instructions and well-done title screens (which use semigraphics-24 mode for some novel effects), is auto-overlayed by the data and game modules. Later, when you want to skip instructions and get right onto those fleering critter-ships, you can bypass that module and *CLOADM* "DATA" and "REVENGE."

A Sugar Software auto-run machine language program governs loads. (Sugar licenses its purchasers to use it in their own commercial programs. Good deal.) I loved the owl logo—you can see it in the Owl-Ware ad in this issue. It's a nicely done sketch, smoothly replicating all those curves. The owl hoots like a demented canary during loading.

This program is well worth having, even if you're not fond of arcade games, both because of the element of humor and because of the graphics effects.

(Owl-Ware, P.O. Box 116, Martztown, PA 19539, $16.95)

—Detective Fuzzy

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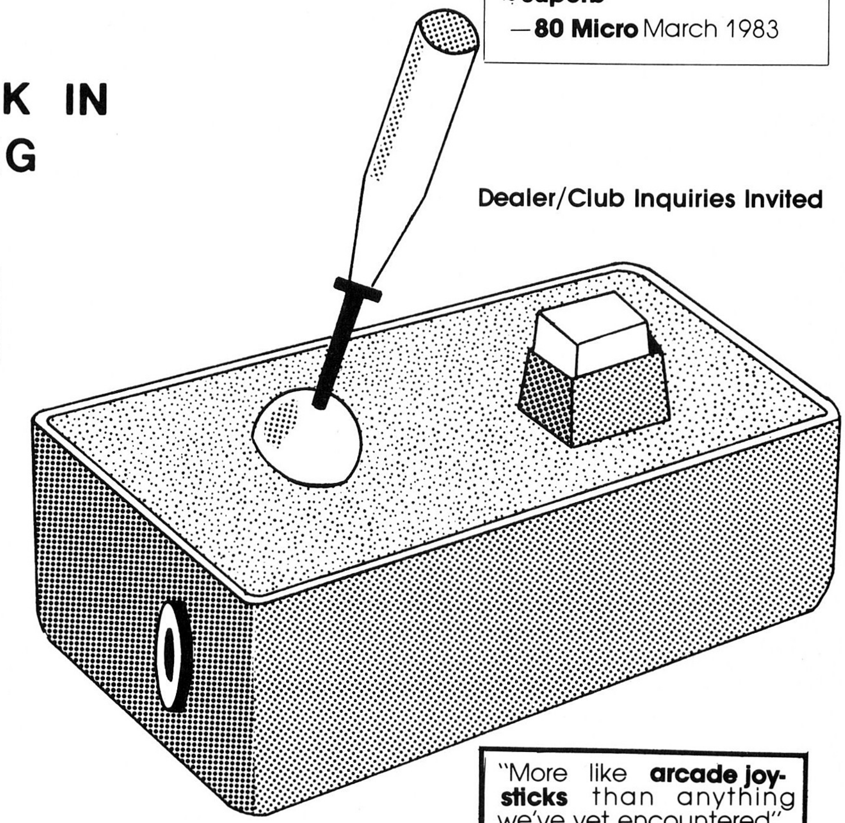

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Rainbow review October 1982, Page 112

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A Colorful Game Of Draw —That's *Color Poker*

By Joseph Kohn

Color Poker duplicates the electronic draw poker games prevalent in Vegas, and requires 16K, Extended BASIC. Playing is quite simple. The machine deals you five cards. You have the option of keeping all of them or discarding up to four to improve your hand. How much you win, if you are lucky, is based on the built-in odds for each winning hand. I use the same odds as Las Vegas, except that I don't require that a valid pair be jacks or better. I don't like losing that much! If you want to be more daring, I've included the program changes.

The Color Computer is ideal for providing the card graphics and colors that make the game visually interesting. The speed of the Extended Color BASIC in implementing the graphic commands keeps play at a brisk pace.

The program is composed of four main parts: graphics routines (lines 80-870), the actual play of deal and discard (lines 880-1320), determining the value of your hand (lines 1330-1620) and the final tally of your finances (lines 1630-1710).

The bulk of the graphics routines are the *DRAW* strings in lines 90-650. These, along with the *DRAW* subroutine in line 670, provide the alphanumeric displays that both prompt the player and provide all the necessary information for playing.

These strings are a subset of a very useful library program which I call Font. This consists of the *DRAW* strings for all the ASCII characters and provides a source of alphanumerics for a great many of my high resolution programs. By changing scale factors, start positions and colors, many interesting effects can be created. The title screen utilizes a scale of S16, each word is drawn with green, then offset and redrawn with blue.

After displaying the odds for each winning combination, play starts by selecting the bet in line 900. I have generally found that most games requiring you to choose a bet quickly become boring. Therefore I decided to make the betting random, which introduces more chance and interest. Here the variable BT is set from $100 to $1000 in $100 steps. The bet changes to thousands after you have more than $20,000. This is accomplished by using the logical statement TT>20000, where TT is your total bankroll. The INT function is required because of the inaccuracies of the exponential operator, which could produce undesirable digits to the fourth decimal place.

Each deal is from a fresh deck, set in line 930. Five cards are dealt at random and the cards are drawn on the screen. The card shape uses the *LINE* command with a filled box. The card values are drawn using the *DRAW* strings, then the appropriate symbol is placed on the card face using PUT.

The player enters the numbers of the cards he wishes to discard. The discards are indicated by boxes around the selected cards. If a mistake is made, the player can cancel his entries and start over.

After being dealt replacement cards, scoring of the hand proceeds. This starts with sorting the cards by face value. Tests are made for all possible winning combinations starting with straights, then flushes and finally ending with a single pair.

If the cards do not produce a winning hand, the bet is subtracted from the player's bankroll. Winning hands are paid off according to the odds stored in the corresponding *DATA* statements, line 850.

As I indicated, if you wish to define a valid pair as jacks or better, do the following: Extend line 1580 with :Y=CV(CD(X)). And add line 1605 as follows: 1605 IF Y<11 AND Y>1 THEN 1620.

Good luck!

COLORSOFT™

ESCAPE

A 3-D GRAPHICS ADVENTURE WITH SOUND
(Machine Language for Fast Action)

This is NOT the usual "find the treasure" adventure. In **ESCAPE**, you are trapped on the top floor of a skyscraper and the only way out is by using a very unusual elevator. You must give the elevator the correct code or else the ride down is a real killer. The maze-like halls seem to come to life due to the fantastic 3-D graphics. Search the halls for rooms which contain clues to the correct code. Clues must be deciphered to learn the elevator's secret code. Game times depends on the skill of the player, but it is typically 8-10 hours. **ESCAPE** is suitable for group play. A mentally stimulating experience.

16K BASIC $18.95

RECIPE FILE

A CASSETTE BASED STORAGE AND RETRIEVAL SYSTEM

This program permits storage of your favorite recipes for retrieval by your computer. Once a recipe has been recalled, then the computer can adjust the ingredient measure for serving the desired number of persons. Each recipe can contain special comments on preparation as well as the full instructions for using the recipe. Included is a line oriented text editor for creating and editing the variable length files. Completely menu driven and very user friendly. Easily modified by the user for use in keeping track of record, coin or stamp collections or whatever your interest. Screen or printer output.

16K Ext. BASIC $21.95

SPECIAL: *A collection of 30 recipies covering main meals to snacks. Only $3.95 with program.*

SQUIRE

SQUIRE is a challenging game of asset management. The player must manage a country estate and contend with crop failure, investment losses, taxes and other such headaches. The object of the game is to increase the estate's value while providing for the peasant workers. The starting assets are computer selected so that each game offers different challenges. Great experience for the kids or aspiring executives.

16K Ext. BASIC $14.95

HOUSEHOLD EXPENSE MANAGER

This menu driven program package is designed for creating and maintaining a data file on cassette of 30 household expense categories for a 12-month period. It also keeps cumulative totals and a separate total of tax deductable expenses. A comparative analysis program provides a graphic presentation of relative expenses between any two months during the year. The user can change categories by modifying program code. Screen or printer output.

16K Ext. BASIC $19.95

FLIPPER

A fun and challenging version of the Othello™ type board games. This version includes options for play solely by the computer, one player against the computer, or two players against each other. The computer can play on four skill levels. Very colorful with plenty of sound. Fun for kids and challenging for adults. Great for parties.

16K Ext. BASIC $16.95

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Table 1. List of Key Variables

CS—Card suit
CV—Card value
CD—Cards dealt
BT—Player bet
TT—Player bankroll
OD—Odds for winning hand
DC—Discards

A cassette copy of *Color Poker* is available from the author for $5. Send to: Joseph Kohn, 1343 Blossom Avenue, Redlands, CA 92373.

400	0543
730	0AAB
1000	0FF8
1400	153B
END	1A07

The listing:

```
10 GOTO30000
20 '
30 'COLOR POKER
40 'JOSEPH KOHN
50 '1343 BLOSSOM AVE
60 'REDLANDS,CA 92373
70 CLS:DIM A$(89):X=RND(-TIMER)
80 '---DRAW STRINGS
90 A$(33)="U4E2F2D2NL4D2BR3" 'A
100 A$(35)="BR3E1BU4H1L2G1D4F1R2
BR4"'C
110 A$(36)="U6R3F1D4G1L3BR7" 'D
120 A$(37)="R4BU6L4D3NR2D3BR7" '
E
130 A$(38)="U6NR4D3NR2D3BR7" 'F
140 A$(39)="BR4BU5H1L2G1D4F1R3U2
NL1D2BR3" 'G
150 A$(40)="U6D3R4U3D6BR3" 'H
160 A$(41)="BU6BR1R2L1D6L1R2BR4"
 'I
170 A$(42)="BU1F1R2E1U5BD6BR3"
'J
180 A$(43)="U6D3R1NE3F3BR3" 'K
190 A$(44)="NU6R4BR3" 'L
200 A$(45)="U6F2ND1E2D6BR3" 'M
210 A$(46)="U6F4U4D6BR3" 'N
220 A$(47)="BU1U4E1R2F1D4G1L2NH1
BR6" 'O
230 A$(48)="U6R3F1D1G1L3BF3BR4"
'P
240 A$(49)="BU1U4E1R2F1D3G1NH1NF
1G1L1NH1BR6" 'Q
250 A$(50)="U6R3F1D1G1L3R1F3BR3"
 'R
260 A$(51)="R3E1U1H1L2H1U1E1R3BD
6BR3" 'S
270 A$(52)="BU6R4L2D6BR5" 'T
280 A$(53)="BU1U5BR4D5G1L2NH1BR6
" 'U
290 A$(54)="BU4NU2F1D1F1ND1E1U1E
1U2BD6BR3" 'V
300 A$(55)="NU6E2F2NU6BR3" 'W
310 A$(57)="BU6D1F2E2U1D1G2D3BR5
" 'Y
320 A$(65)="BU4R2F1D1L2G1F1R2NU2
R1BR3" 'a
330 A$(66)="U6D2R3F1D2G1L3BR7" '
b
340 A$(67)="BU4BR2NF1L2G1D2F1R2N
E1BR4" 'c
350 A$(68)="BU4BR4L3G1D2F1R3NU6B
R3" 'd
360 A$(69)="BR3L2H1U2E1R2F1D1NL4
BD2BR3" 'e
370 A$(72)="U6D3E1R2F1D3BR3" 'h
380 A$(73)="BU6BR1R1BD2NL1D4L1R2
BR4" 'i
390 A$(79)="BU1U2E1R2F1D2G1L2NH1
BR7" 'o
400 A$(82)="U4D1E1R2F1BD3BR3" 'r
410 A$(83)="R3E1H1L2H1E1R3BD4BR3
" 's
420 A$(84)="BU5R4L2U1D5F1E1BD1BR
3" 't
430 A$(85)="BU4D3F1R2NU4R1BR3" '
u
440 A$(86)="BU4F1D1F1ND1E1U1E1BD
4BR3" 'v
450 A$(87)="BU4D3F1E1NU2F1E1U3BD
4BR3" 'w
460 A$(89)="BU4D3F1R3U4D5G1L3BU2
BR7" 'y
470 A$(0)="BR3"'SPACE
480 A$(1)="BR1R1BU2U4BD6BR5" '!
490 A$(4)="BR2U6D1R2L3G1F1R2F1G1
L3BD1BR7" '$
500 A$(12)="U1R1D1NL1D1G1BU2BR7"
 'COMMA
510 A$(13)="BU3R4BD3BR3" '-
520 A$(16)="BU1U4E1R1F1D4G1L1NH1
BR6" '0
530 A$(17)="BU6BR2NG1D6L1R2BR4"
'1
540 A$(18)="BU5E1R2F1D1G1L2G1D2R
4BR3" '2
550 A$(19)="BU5E1R2F1D1G1NL1F1D1
G1L2NH1BR6" '3
560 A$(20)="BU2U1E3D4NR1NL3D2BR4
" '4
570 A$(21)="BU1F1R2E1U2H1L3U2R4B
D6BR3" '5
580 A$(22)="BU6BR3L1G2D3F1R2E1U1
H1L3BD3BR7" '6
590 A$(23)="BU6R4D1G4D1BR7" '7
600 A$(24)="BU1U1E1R2E1U1H1L2G1D
1F1R2F1D1G1L2NH1BR6" '8
610 A$(25)="BR1R1E2U3H1L2G1D1F1R
3BD3BR3" '9
620 A$(26)="BU6NG1D6L1R2BR2BU1U4
E1F1D4G1NH1"  '10
630 A$(27)="U1R1D1L1BU3U1R1D1L1B
D5E1U1BR6" ';
640 A$(29)="BU2NR4BU2R4BD4BR3" '
```

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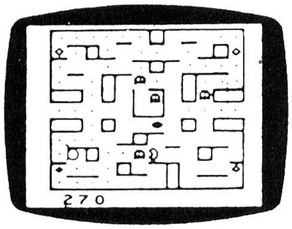

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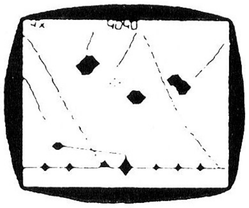

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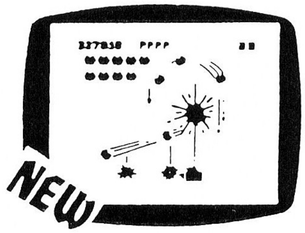

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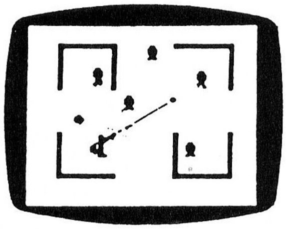

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```
=
650 A$(31)="BR1R1BU2E2U1H1L2G1BD
5BR7" '?
660 GOTO680
670 FORX1=1TO LEN(X$):Y1=ASC(MID
$(X$,X1,1))-32:DRAW"XA$(Y1);":NE
XT:RETURN
680 PMODE1,1:PCLS2:DRAW"BM36,52;
S16C1":X$="COLOR":GOSUB670:DRAW"
BM40,52;C3":GOSUB670:DRAW"BM72,1
12;C1":X$="POKER":GOSUB670:DRAW"
BM76,112;C3":GOSUB670
690 '---CREATE DECK
700 Z=0:DIMCS(52),CV(52),DD(52),
C(12),H(12),S(12),D(12)
710 FORX=1TO4 '1=CLUB,2=SPADE,3=
HEART,4=DIAMOND
720 FORY=1TO13:Z=Z+1:CS(Z)=X:CV(
Z)=Y:NEXTY,X
730 '---CREATE SYMBOLS
740 DRAW"BM68,156;S8C3R1U1R1D1R2
U2L1U1R1U1R3D1R1D1L1D2R2U1R1D1R1
D3L1D1L1U1L3D2L1U2L3D1L1U1L1U3"
750 PAINT(80,152),3,3:GET(68,148
)-(91,167),C,G
760 DRAW"BM100,156;C4BR1R1U1R1U1
R1U1R1U1D1R1D1R1D1R1D1R1D1L1D1L1
D1L1D1L1D1U1L1U1L1U1L1U1L1U1"
770 PAINT(114,156),4,4:GET(100,1
48)-(123,167),D,G
780 DRAW"BM132,156;C3BR1R1U1R1U1
R1U1R1U1R1D1R1D1R1D1R1D1R1D2L1D1
L1U1L2D3L1U3L2D1L1U1L1U2"
790 PAINT(146,156),3,3:GET(132,1
48)-(155,167),S,G
800 DRAW"BM164,156;C4BR1U2R1U1R1
U1D1R1D1R3U1R1U1D1R1D1R1D2L1D2L1
D1L1D1L1D1L1U1L1U1L1U1L1U2L1"
810 PAINT(170,152),4,4:GET(164,1
48)-(187,167),H,G
820 SCREEN1,0:FORX=1TO3000:NEXT
830 '---ODDS DISPLAY
840 PRINTSTRING$(8,"*")"C0C0 CAS
INO ODDS"STRING$(8,"*")"
850 DATA 1   ONE-PAIR,2   TWO-PA
IR,3   THREE-OF-A-KIND,4   STRAI
GHT,6   FLUSH,9   FULL-HOUSE,25
 FOUR-OF-A-KIND,50  STRAIGHT-FLU
SH,250 ROYAL-FLUSH
860 FORX=5TO10:READA$(X):PRINTMI
D$(A$(X),4);TAB(24)VAL(A$(X))"TO
 1":NEXT:FORX=27TO28:READA$(X):P
RINTMID$(A$(X),4);TAB(23)VAL(A$(
X))"TO 1":NEXT:READA$(29):PRINTM
ID$(A$(29),4)TAB(22)VAL(A$(29))"
TO 1"
870 PRINT@416,"YOUR INITIAL BANK
ROLL IS $1000!!":TT=1000:PRINT@4
80,"READY?";
880 IF INKEY$=""THEN880 ELSE CLS
890 '---START PLAY
900 COLOR2,1:PCLS:BT=INT(100*10^
(-(TT>20000))*RND(10)):BT$=MID$(
STR$(BT),2):DRAW"BM20,20;C4":X$=
"Your bet is $"+BT$+"!":GOSUB670
910 DRAW"BM20,40":X$="GOOD LUCK,
PAL!!!":GOSUB670:SCREEN1,0
920 '---CLEAR DECK
930 FOR X=1TO52:DD(X)=0:NEXT
940 FORX=1TO5
950 GOSUB1010
960 Y=12+48*(X-1):Y$=STR$(Y)
970 DRAW"BM"+Y$+",62;C2":X$=CHR$
(X+48):GOSUB670
980 GOSUB1140:GOSUB1020
990 NEXT:GOTO1150
1000 '---DEAL
1010 Z=RND(52):IF DD(Z)=1THEN101
0ELSECD(X)=Z:DD(Z)=1:RETURN
1020 '---CARD GRAPHICS
1030 IF CS(Z)=1 OR CS(Z)=2 THEN
CC$="3" ELSE CC$="4"
1040 IF CV(Z)>1 AND CV(Z)<11 THE
N X$=CHR$(CV(Z)+48)
1050 IFCV(Z)=1THENX$="A"
1060 IFCV(Z)=11THENX$="J"ELSEIFC
V(Z)=12THENX$="Q"ELSEIFCV(Z)=13T
HENX$="K"
1070 DRAW"BM"+STR$(Y+4)+",84;S8C
"+CC$:GOSUB670
```

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```
1080 DRAW"BM"+STR$(Y+24)+",130":
GOSUB670
1090 ON CS(Z) GOTO 1100,1110,112
0,1130
1100 PUT(Y+8,92)-(Y+31,111),C,PS
ET:RETURN
1110 PUT(Y+8,92)-(Y+31,111),S,PS
ET:RETURN
1120 PUT(Y+8,92)-(Y+31,111),H,PS
ET:RETURN
1130 PUT(Y+8,92)-(Y+31,111),D,PS
ET:RETURN
1140 COLOR2,1:LINE(Y,68)-(Y+39,1
35),PSET,BF:RETURN
1150 '---DISCARDS
1160 DRAW"BM12,160":X$="Discards
?":SOUND100,1:GOSUB670
1170 FORX=1TO4:DC(X)=0:NEXT:A=1
1180 K$=INKEY$:IF K$=CHR$(13)THE
N 1240 ELSE IF K$=""THEN1180ELSE
K=VAL(K$):IFK<1 OR K>5 THEN 1180
1190 IF K$=CHR$(13)THEN1240
1200 IFA=5THEN1180
1210 FORX=1TO5 :IF DC(X)<>K THEN
 NEXT ELSE1180
1220 DC(A)=K:A=A+1
1230 LINE(10+48*(K-1),48)-(52+48
*(K-1),136),PSET,B:GOTO1180
1240 DRAW"BM12,184":X$="OK?":SOU
ND100,1:GOSUR670
1250 K$=INKEY$:IFK$=""THEN1250EL
SEIFK$="Y"THEN1290ELSEIFK$<>"N"T
HEN1250
1260 GOSUB1320
1270 FORK=1TO4:IFDC(K)THENGOSUB1
310
1280 NEXT:GOTO1160
1290 GOSUB1320:FORK=1TO4:IF DC(K
) THEN GOSUB1310:X=DC(K):GOSUB10
10:Y=12+48*(X-1):GOSUB1140:GOSUB
1020
1300 NEXT:GOTO1330
1310 LINE(10+48*(DC(K)-1),48)-(5
2+48*(DC(K)-1),136),PRESET,B:RET
URN
1320 LINE(0,140)-(255,191),PRESE
T,BF:RETURN
1330 '---SCORING
1340 LINE(0,0)-(255,67),PRESET,B
F
1350 DRAW"BM12,20":X$="How did y
ou do?":GOSUB670
1360 '---SORT
1370 FORX=1TO4:Z3=X:Z1=CV(CD(X))
:FORY=X TO5:Z2=CV(CD(Y))
1380 IF Z2<Z1 THEN Z1=Z2:Z3=Y
1390 NEXTY:Z4=CD(X):CD(X)=CD(Z3)
:CD(Z3)=Z4:NEXTX
1400 '---TEST STRAIGHT
1410 S=1:SA=0:FORX=2TO4:IF CV(CD
```

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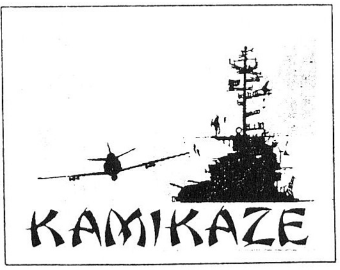
```
(X))+1<>CV(CD(X+1))THENS=0:GOTO1
440ELSENEXT
1420 IF CV(CD(1))=1 AND CV(CD(5)
)=13 THEN SA=1:GOTO1440
1430 IFCV(CD(1))+1<>CV(CD(2))THE
NS=0
1440 '---TEST FLUSH
1450 FL=1:FOR X= 1TO4:IFCS(CD(X)
)<>CS(CD(X+1))THENFL=0:GOTO1460E
LSENEXT
1460 IFFL AND SA THEN X$=A$(29):
GOTO1630
1470 IFFL AND S THEN X$=A$(28):G
OTO1630
1480 '---TEST 3- OR 4-OF-A-KIND
1490 T(1)=0:T(2)=0:T(3)=0
1500 FORX=1TO3:IFCV(CD(X))=CV(CD
(X+1))ANDCV(CD(X+2))=CV(CD(X+1))
THENT(X)=1
1510 NEXT
1520 IF(T(1) AND T(2)ANDFL=0)OR(
T(2)ANDT(3)ANDFL=0)THEN X$=A$(27
):GOTO1630
1530 IF(T(1)ANDCV(CD(4))=CV(CD(5
)))OR(T(3)ANDCV(CD(1))=CV(CD(2))
)THENX$=A$(10):GOTO1630
1540 IF FL THENX$=A$(9):GOTO1630
1550 IF S THEN X$=A$(8):GOTO1630
1560 IFT(1)ORT(2)ORT(3)THENX$=A$
(7):GOTO1630
1570 '---TEST PAIRS
1580 PP=0:FORX=1TO4:IFCV(CD(X))=
CV(CD(X+1))THENPP=PP+1
1590 NEXT:IF PP=0 THEN 1620
1600 IF PP=2 THEN X$=A$(6):GOTO1
630
1610 X$=A$(5):GOTO1630
1620 IFRND(2)=1THENX$="-1  YOU H
AVE NOTHING"ELSEX$="-1  WORTHLES
S CARDS"
1630 '---TALLY
1640 OD=VAL(X$):X$=MID$(X$,4)+"!
"
1650 DRAW"BM12,50":GOSUB670
1660 DRAW"BM12,160":IF OD>0 THEN
 X$="YOU WON ":SC=BT*(OD-1):TT=T
T+SC:FORX=1TO5:SOUND50,1:SOUND15
0,1:NEXT  ELSEX$="YOU LOST ":SC=
BT:TT=TT-BT:SOUND50,5
1670 SC$="$"+MID$(STR$(SC),2):X$
=X$+SC$+"!":IF OD=1 THEN X$="EVE
N MONEY!"
1680 GOSUB670:TT$=MID$(STR$(TT),
2)
1690 DRAW"BM16,184":IF TT<0 THEN
 X$="You owe $" ELSE X$="You hav
e $"
1700 X$=X$+TT$+"!":GOSUB670
1710 IFINKEY$=""THEN1710ELSE890
30000 PCLEAR2:GOTO20
```



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Keeping The Loathsome In Line

(Better Monster Management)

By Bill Nolan
***Rainbow* Contributing Editor**

I was looking through my local game shop the other day, and I couldn't help but notice that there are at least 20 different fantasy games being sold. While they have their differences, there *are* similiarities between them. In general, they are all horribly complex, badly written, and fun to play. The fantasy gaming genre is such a good idea that it rises like a Phoenix from the ashes of confusion and contradiction. I am truly amazed that anyone ever learns to play these games. One of the most popular has five (yes, five—count them) large, hard-cover books of rules, and fully two of these books are devoted to monsters!

With all of these monsters, it's no wonder I can never remember any specifics about a certain one. How many times does it attack? How much damage can it do? How tough is its skin? How fast (or common, or large, or smart) is it? Look it up—that's what I have to do.

The other day it came to me in a vision that I had a computer, and that it could be possible to keep track of one or two hundred monsters, somehow, inside the computer's capacious memory banks. (I hope their claws don't catch on the wires!) It seems to me that if the phone company can keep track of everyone in the world on their computer, I should be able to handle a few dragons and such on mine.

As I thought about this, I came up with a list of requirements for the program:

1) It had to be simple enough for me to understand;
2) It had to be easy to add monsters; and
3) It had to be able to sort the monsters by any criteria I wanted.

Number one was automatic—if I wrote it it would have to be simple enough for me to understand. Number two could be solved by putting each monster in its own *DATA* line. In this way, new monsters could be added by simply adding another *DATA* line to the end of the program.

Number three was a little more complex. Before I could solve this one, I had to decide what information I would store about each monster. I came up with the following: name, size, hit dice, armor class, number of attacks, damage per attack, special attacks, special defenses, magic resistance, intelligence, and alignment. That was 11 things all together, and what I wanted was a program that would call up a monster by name, or would call up—one after the other—all large monsters, or all small, or all with six hit dice, or all with poison, or all with armor class lower than two, or . . . well, you get the idea.

At this point I could see that the program itself was going to be fairly short. Most of the space was going to be for *DATA*. To accomplish the above goals, I needed to be able to search the *DATA* on any one of the 11 criteria, and print any matches to either the screen or printer (or both). This record-keeping was starting to look easy, and I began to see how even the phone company could do it. I would need a menu asking the menu which criteria they wanted to search, and then, depending on their choice, I would have to get the target values. If you are new to searches, let me explain about targets. Suppose I have a mailing list, and I want to print out all the people named Smith. Smith becomes the target, and I go through the list one record at a time and compare the last name of the person to the Target. If the person's name happens to be Smith, then the search string will match the target, and the computer will do whatever you told it to do when this happend.

I wanted to be able to search for not only a specific target, but also for a specified range, and that was the hard part, since some of my targets would be strings and others would be numbers. I decided that the easiest way to do this would be to have two completely separate search sections. Next month I will give you the complete program.

This type of program is very flexible. If you don't like monsters, you could use it to keep track of a mailing list, or a collection, or most any kind of information. This kind of a program is called a data base, and I will tell you how to modify this one for various uses. Keeping the data in *DATA* lines is not the best way to handle a data base, but it is easy to use and understand, and you can switch to another system as your needs become more sophisticated.

As usual, let me know right away if I forgot anything important. I look forward to seeing many of you in Chicago at Rainbowfest.

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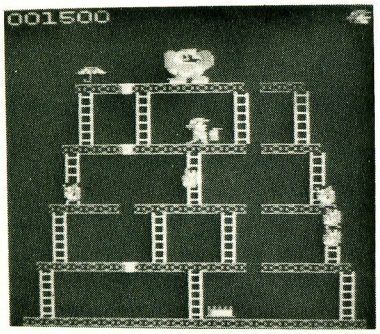

ON THIS SCREEN:
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We're sure you already know the rules to this game! As game progresses so does the difficulty level.

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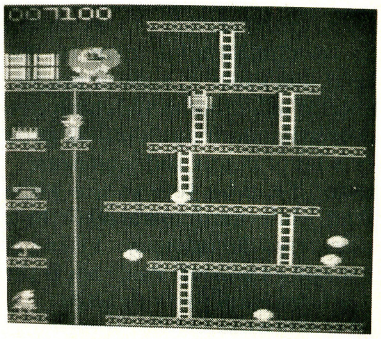

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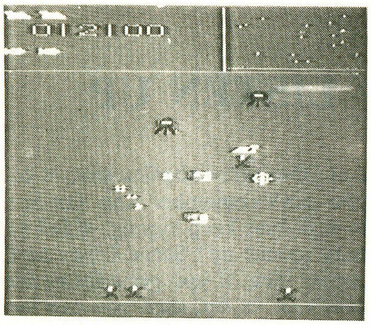

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Upper & Lower Case

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3. You're Back in BASIC with a 64 x 32 Screen plus....

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of programs by others are allowed.

We expect the simulation contest will be a lot of fun. The top winning programs will be published in *the Rainbow*. Other winners may be included in a book.

And speaking of books, we plan to announce shortly the publication of our first book, *the Rainbow Adventure Book*. It will contain all the winning Adventures from our recent contest. This is in response to requests from many of you for a compilation of all the winning programs from our recent contest.

In the way of finally, I have received a couple of letters in recent weeks asking whether we plan to have a reader service card available in *the Rainbow*. My initial reaction is "no." And the reasons why are simple:

First of all, reader service is slow. If you are interested in a product, you are interested in it *now*, not six weeks from now. In fact, reader service—to my mind, anyway—is more a service to a *publication* than to the readers (or the advertisers). Let's face it, a lot of people who really aren't very interested in a product will check a reader service card. But, it *does* make the magazine look good to the advertiser to deliver a lot of names and addresses.

No matter if it takes four to five weeks to deliver those names. And, while that does not serve the reader particularly well, it does serve the magazine. I think it is self-serving.

But it is also expensive. And that is the other reason we have not offered reader service cards.

First, it is expensive for the magazine to print such cards, and to operate the reader service system—especially when it is contracted to an outside firm, as most are. Who pays for that? Not the magazine. And not the advertiser. You do. Through increased prices for products.

In addition to that direct expense, the advertiser then must mail something to everyone who fills out a reader service card. And, remember, that message arrives five to six weeks after the person has expressed an interest.

We get reader service from several of the publications in which we advertise *the Rainbow*. First of all, response is low (if someone is interested, he or she will usually write direct). Second of all, we see a great deal of repitition—the same persons checking the cards over and over again. And third, we see evidence a great number of people check every single entry on the card.

In sum, we think the reader service card is a slow way to request information; that it drives up the price of products; and that it is often used more as an advertising selling tool than as a service to readers.

But, maybe we're all wet. As always, if you—*our readers*—think a reader service card is that important, then we will certainly consider instituting one. I would, as always, welcome your input into the issue.

—Lonnie Falk

RAINBOWfest

Chicago April 22-24

Hackers' Helper . . .

Canadian Offset

Edgar Poulin, of Sherbrooke, Quebec, Canada, offers a method of using an offset in loading machine language programs to disk if this is to be different from the *SAVEM* location. "Instead of calculating the offset, I let my 80C do the hard work."

Ed's method:

A — If the new location is to be in higher memory than the old.

```
LOADM "Filename", (new start address - old start
  address)
Examples:
  LOADM "NAME", (&H7000-&H3C75)
  LOADM "NAME", (28672-15477)
```

Both will work.

B — If the new location is to be lower in memory than the new.

```
LOADM "Filename", (new start address - old start
  address + 65536
LOADM "NAME", (&H3C75-&H7000) + 65536
LOADM "NAME", (15477-28672) + 65536
```

Again, both will work.

Use the last number in decimal as 80C will not recognize &H10000 (which is 65536). If anyone insists on only hex, 65536 can be replaced with &HFFFF + &H1.

Another little item Ed offers will interest those with a disk system in merging and running two programs.

```
MERGE "FILE NAME", R
```

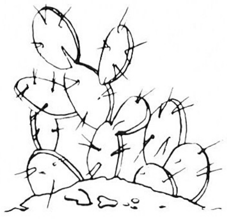
"This command will merge the two programs together and automatically run them. It is great for header listings to the printer," explains Ed, adding that "it is these little unknowns that make the 80C a pleasure to work with."

Hint...

LISTEN UP

So, you've got an IO error on the first save of your favorite program, and you can't remember how far in the second save is. What to do? Just keep typing *CLOAD* until the second save finally comes up? Steve Lipps of Circle City Software has a better idea. If you put a little space between your saves, as many of us do, then you can listen for the second save. Says Steve, "Just use *AUDIO ON: MOTOR ON* and listen for the silent space. Then you can use *MOTOR OFF*. Even faster than *MOTOR OFF* is to hit any key and then *ENTER*, creating a syntax error which will stop the recorder." Then *CLOAD* the second save.

Of course, this isn't something you want to do every time you load the program, so use the tape recorder counter and note where the first save ends. Now, with the "record" and the "play" buttons down, start from the beginning of the tape and use *MOTOR ON* until you reach the same spot and stop by creating a quick syntax error. This will erase the entire listing; it was bad anyway, right?



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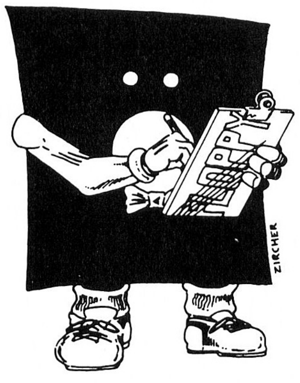
DISK UTILITIES



The Disk Manager

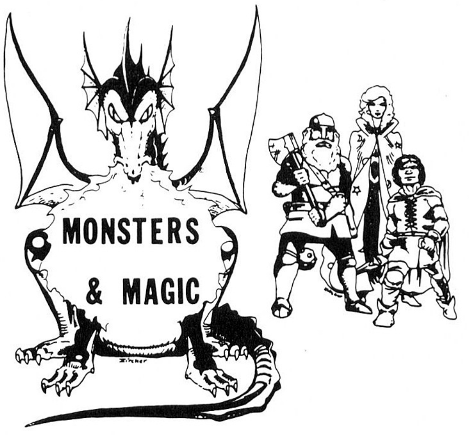
If you use a disk drive you NEED this program! It does more than any other disk utility. You can use it to rebuild a crashed disk easily - two different ways. You can also print a SUPER DIRECTORY for a disk that contains such information as program size, which granules are used, and the start, end, and execute addresses for machine language programs. It will also print a menu on the screen for a disk in the drive, and when you indicate your choice it will load and either RUN or EXEC the program for you as appropriate. In addition, it codes your files by DATE, and it codes your disks by NAME and NUMBER. And, it creates and maintains a file of all your disks (and the programs on them) which you can sort and print as needed. You can sort a collection of up to 300 disks. Could you use a printed list of EVERY program in your collection, in alphabetical order? This list tells you which disk has the program you need so you can find it easily, and all this is only the beginning. There are so many features we have no space to mention them all. Both the 16K and 32K versions are included, and we suggest you place a copy of the program on every diskette for quick access. You will wonder how you got along without this beauty!! Full, easy to follow instructions. Requires a disk drive. **$29.95**

NEW THIS MONTH

The Disk Master

This helpful addition to your library performs a whole list of great functions. We've seen programs selling for just as much that do only one or two of these things, and the whole thing is menu driven for ease of use. It provides a speed check and adjustment function to get your drives into perfect adjustment. It moves programs from tape to disk — or disk to tape — or from one drive to another — all effortlessly. It prints a directory — with machine language addresses — to the screen or printer. It gives you two different disk maps. One shows which sectors are used in each gran, and the other shows which grans are available. It even gives you a way to easily purge a number of files from a crowded disk. Why buy a different program for every function, when this does so much? Requires a disk drive. **$24.95**

Your Personal check is welcome - no delay. Include $1.50 shipping for each program ordered. (Shipping free on $50.00 or larger orders). Az. residents add 6% sales tax. Orders shipped within two days.



Monsters & Magic

The most realistic fantasy role-playing game yet for the Color Computer. You start out by rolling up your character's basic ability scores and buying equipment. When you are ready it's into the dungeon. Your character starts at first level, but can rise in levels by garnering experience in the fray. If you have role-played fantasy games you will be amazed at the realism of the combat system. Armor class, initiative, and damage by weapon type are all included, with over 50 different monsters to fight - each with it's own abilities. As you rise in level you can win treasure and magic weapons and spells - if you live!! You set the game length by telling how many monsters you want to fight before you reach your final battle to the death against the powerful Dungeon Lord. There are 1000+ place description combinations in this text based game, and real excitement in every one! This is a fantasy simulation, and is truly not like any adventure game you have ever seen. For 1 player; requires 32K extended BASIC. **TAPE - $19.95, DISK - $24.95**

Astrology

Truly a classic, this program will accurately cast your complete horoscope. You just enter the date, time, and place of birth. The sun sign, rising sign, mid heaven (MC), lunar nodes, and planetary influences including houses and aspects between the planets will all be calculated, and a full chart drawn. You can also do progressed charts and transits. It will even tell you the day of the week you were born. The accompanying book will help you interpret this chart of your horoscope. The extent of the documentation is tremendous, even by our exceptionally high standards, and no previous knowledge of the subject is required. You can share in this wisdom which has been used for thousands of years in many cultures. This program was written by a professional Astrologer. Please specify 16K or 32K system. **$34.95 tape — $39.95 disk**

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DISK UTILITY

Learning To Live With A One Disk System

By Melvin Hefter

After working with large and medium size computer systems for many years, I know that one never configures a computer system with only one disk drive. Even if the total on-line storage capacity is not required, ease of disk backup makes an extra drive worthwhile. With this knowledge in hand, when I got my Color Computer I got it with only one disk drive. I knew I could always expand later.

As I read through the disk manual, I saw that there was a backup capability provided, even for single disk systems. My disk backup problems were solved! I would just routinely use this capability to protect myself. I had only a few files on my first disk. I put in the command BACKUP 0 and was told to put in my source disk. A few whirls of the disk and I was told to put in the destination disk. That seemed fair enough. A few more whirls of the disk and it told me again to put in the source disk. But wait a minute! I know my 32K machine can hold all I had on that source disk at one time. I dutifully complied, and complied, and complied for six cycles. Then it became obvious that the BACKUP command must be doing a physical copy; that is, copying all parts of the disk whether used or not, as opposed to a logical copy of just the used areas. The physical copy is a valuable capability for disks which may be used in a nonstandard manner, but I would have liked to have had the other option for my few files.

Being human and recognizing that my disk drive was quite reliable, I soon got out of the habit of routinely backing up my disks as often as I should. And then, of course, I had my first disk I/O error. Not only could I not get the file I wanted, I could not list the disk contents with the *DIR* command. I licked my wounds and went back to my now too-old backup disk and started to redo what I lost.

I soon found out that when disk I/O errors occur they tend to come in bunches. I got the connection, turned off my computer, disconnected all of the connections, reconnected them, and my problems went away. Not only did I find that most of my disk problems were connector related, I also found that when I had a problem, it almost always resulted in the disk directory being damaged and the total disk content becoming inaccessible.

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Time to go back to the disk manual for some serious study. I found that the control and index information is contained in track 17 of the disk. I also found that only sectors 2-11 (out of a total of 18 sectors) were used for the needed information and that the rest of the sectors were reserved for future use. But I figured that while I was waiting for that future use I might get some benefit from those unused sectors now. Why not duplicate the directory information in those unused sectors so they can be reclaimed if the real directory information becomes unreadable?

Sector 2 of track 17 contains a file allocation table showing which granules on the disk are used and how they are related to each other. I could duplicate this in unused sector 1. The other nine sectors (3-11) contain such information as the file name and type. I have only seven sectors of track 17 available (12-18) so two sectors will go unduplicated. Actually, this is not a problem since all nine sectors of directory information would be used only with a full disk and no files taking up more than one granule. The 56 files which can be kept in seven sectors have been plenty.

I generally use the *VERIFY ON* command so that I know when I have a problem as soon as possible. The program I use for duplicating and restoring the needed directory information is a simple one that I run in a few seconds whenever I add a file to my disk or make any significant changes. A RUN command duplicates the information. When I have a problem and the DIR command results in an I/O error, a RUN 100 command will restore the directory to its configuration during the last run of this program. If the *DIR* works OK, do not use this recovery procedure. Just accept the loss of one file. I keep a copy of this program on each of my disks so that it is easily available for running and always conveniently available when I have a problem.

This procedure is not perfect and will not guarantee total recovery of all data. If a file has been changed since the last run of the program, you may lose the last few lines or end up with garbage at the end. If you have a bad sector in the data file, that file may be unrecoverable, but the rest of the disk will be accessible. If you actually have a bad spot on the disk on the directory track, as opposed to just a bad disk write, it may not work. I also supplement this procedure with some common sense precautions like storing important files on more than one disk, treating the disks with the kind of gentle treatment they do require, keeping my connections clean, and using the BACKUP command to produce total duplicates of disks I cannot afford to lose.

I have found that an imperfect procedure used frequently is better than a perfect procedure that I do not use!

(Mr. Hefter is president of Custom Software Engineering of Cocoa Beach, Florida.)

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All the features of the above with much more memory space. Ideal for small business applications. Documentation is available for $5. and is refundable with your order.

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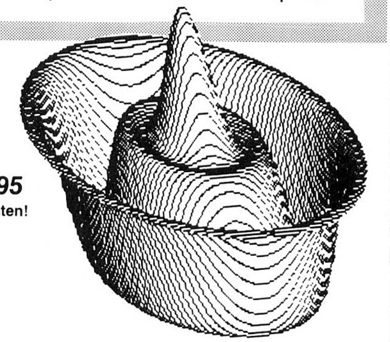
Bring out the artist in you and your family! With PAINTPOT you can create fast, effortless sketches and drawings. PAINTPOT gives you joystick or keyboard control on 4 screens. (3 screens on 16K) There are 4 cans of paint to play with! A touch of a key starts animation effects flashing from screen to screen. Your works of art can be saved or loaded from cassette or disk and, with our Screen Print Program (see below) you can have a hard copy on your printer. PAINTPOT comes with complete documentation and a help screen is available. Great fun for kids and creative adults!

$24.95 on cassette, $29.95 on disk. Both 16 & 32K on the same tape/disk. Extended Basic required.



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For use with Epson MX-80/100 printers. Three print formats, all versions of Basic, PMODES0,2,3&4. Normal or negative image. Complete documentation. Many useful features!

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Transfer your programs to disk or tape effortlessly. Allows you to individually select or mass copy programs.

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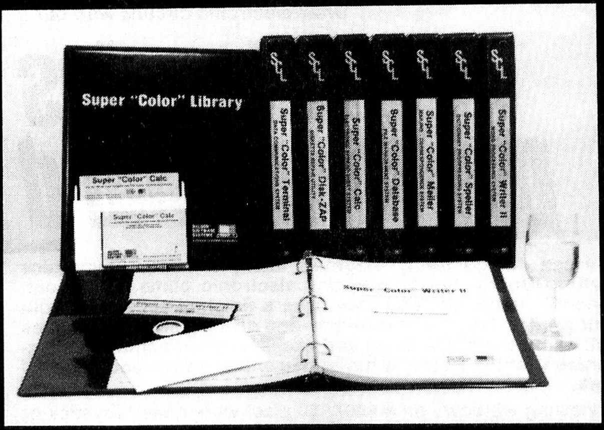
Super "Color" Library™

For the TRS-80 Color and TDP System 100 Personal Computers



No matter what kind of problem you are trying to solve with the Color Computer, there is a program in the ever-expanding integrated, **Super "Color" Library** that will give you the solution; Faster, Better, Smarter!

Every Library program features **MEMORY-SENSE** to determine your computer's memory, from 16 to 64K, and adjusts automatically to maximize work space. All programs, except the **Super "Color" Speller** and **Super "Color" Disk-ZAP**, feature a true lowercase display with below line descenders. Each program has been written specifically for the Color Computer in fast machine code to be totally compatible for optimum performance — Something a motley assortment of programs from diverse sources or a passel of overpriced, wallet-FLEXing software from a bygone era simply can not achieve.

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64K Compatible

Super "Color" Writer II™

32x16 & 51-64-85x21&24 WITH REAL LOWERCASE DISPLAY

VERSION 3.0 By Tim Nelson

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Of course the **Super "Color" Writer II** has all the features you would expect from the highest quality word processor, such as a clear, crisp and readable professional display with your choice of display colors, 9 display formats; standard 32x16 & 51-64-85x21 &24 with real lowercase descenders; full 4-way cursor control, sophisticated edit commands, the ability to edit any BASIC program or ASCII textfile, seven delete functions, locate and change, wild card locate, a real block move & copy, word wrap-around, programmable tabs, display memory used and left, non-breakable space, multiple headers and footers, dynamic text formatting, comprehensive format parameters, use with ANY printer at any baud rate from 110 to 9600 baud, automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, optionally print comments, append text files, available in a ROMPAK cartridge for maximum work space, but that's only half of the story. No other program can even begin to compare in features with the **Super "Color" Writer II.**

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MEMORY-SENSE adjusts to computer's memory (16-64K) for maximum work space; TYPE-AHEAD, TYPAMATIC KEY REPEAT and KEY BEEP for the pros; 3 PROGRAMMABLE FUNCTIONS; AUTO PHRASE INSERT; COLUMN CREATION; TEXT FILE LINKING; HELP MENU; A TRUE EDITING WINDOW IN ALL 9 DISPLAY MODES; TRUE FORMAT WINDOW to display line lengths up to 255 characters, with horizontal and vertical scrolling to replicate the printed page including centered lines, headers, footers, page breaks, page numbers, margins, giving a perfect printed document every time. Also makes hyphenation a snap; **TRUE AUTOMATIC JUSTIFICATION** for neat, even left and right hand margins; Ability to use CHARACTER CODES for printing special characters available with your printer; freedom to embed as many PRINTER CONTROL CODES as desired anywhere in the text, **EVEN WITHIN JUSTIFIED TEXT;** 90-plus page tutorial manual.

ADDITIONAL DISK FEATURES: Read a directory, Display free granules, Save with Automatic Verification, Load and Append ASCII files, and BASIC programs, Kill files, and Link files from disk for continuous printing. 54K bytes of workspace available with a 64 K system. Only the best offers all of these features.

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Previous **Super "Color" Writer II** owners call for upgrade policy.

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By Tim Nelson

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By Peter A. Stark

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32x16 & 51-64-85x21&24 Display With Lowercase Descenders And 16 Thru 64K Too!

NEW Super "Color" Calc™

ELECTRONIC SPREADSHEET By Kevin Herrboldt

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Features include: 9 display formats; standard 32x16 & 51-64-85x21&24 with real lowercase descenders * MEMORY-SENSE to adjust to computer's memory (16-64K) for maximum work space; Full-size 63x256 worksheet * Easy to use * HELP Menus to make learning faster * Machine code speed and high precision * Total flexibility in calculating * Up to FOUR VIDEO DISPLAY WINDOWS to compare and contrast results of changes * Sine and Cosine functions, Averaging, Exponents, Algebraic functions, and base 10 or 16 entry * Multi-layered Column and Row Ascending and Descending sorts * Locate formulas or titles in fields * Easy entry, replication and block moving of frames * Global or Local column width control up to 81 characters each * Create titles of up to 255 characters * Typamatic Key Repeat * Key beep * Type-ahead * Print up to 132 column worksheet * Prints at any baud rate from 110 to 9600 * Print formats savable along with worksheet * Enter. control codes for customized printing.

DISK FEATURES: Read a directory; Display free granules; Kill files, Save with Automatic Verification; Load files; Append disk files for complete worksheet printing. 54K bytes of worksheet space available with a 64K system.

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ROMPAK $89.95 **DISK $99.95**

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Disk requires 32K for lowercase display.

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By Tim Nelson

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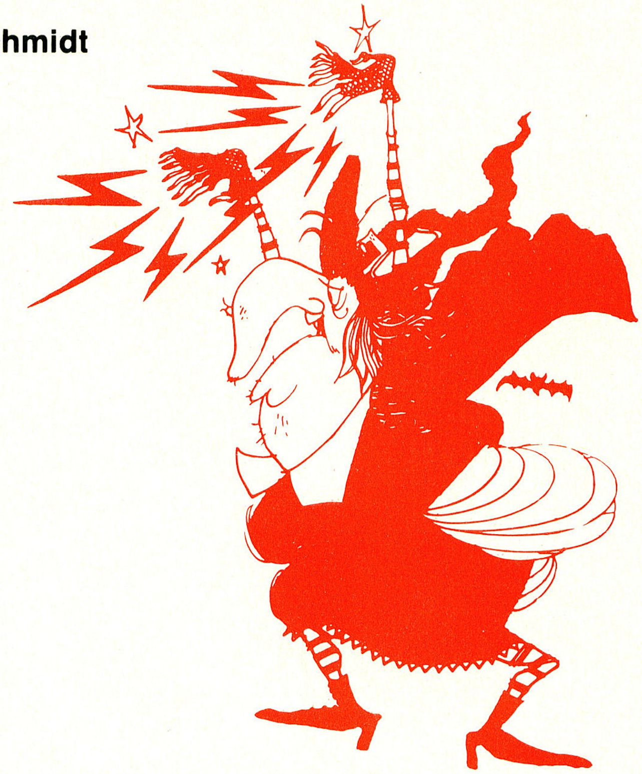
Everything You Wanted To Know About Hex...

By Jim Schmidt



One of the more difficult concepts in the world of computers is that old devil—Hex! The fact that most of us were born with only ten fingers and toes seems to make grasping the concept of another number base more difficult than it should be. Over the years it has sometimes fallen to me to instruct novices in programming on this subject. Most professional programmers have their share of trouble with Hex.

The program I offer here is a BASIC version of one I wrote in COBOL several years ago. Basically, it allows the confused to "play" with Hexadecimal numbers at whatever pace is most comfortable. Coupled with independent reading on number bases and Hex in particular, it lets the concepts involved show themselves through experimentation. It's about as painless a way as I've ever found to investigate and learn about Hex. It can even be fun!

I suggest that in addition to running the "Hexerciser" that the logic of the program, and especially the two conversion commands, be studied. That, plus additional reading on the subject, should eliminate any Hex "hex" that may plague you.

For those of you who will be keying this program in, let me first suggest that you take advantage of the bargain of the century and subscribe to *Rainbow on Tape*. Now, while you're waiting for your first tape, let me save you a little trouble. The following lines are mostly cosmetic and can be ignored:

Line 40
Lines 20000 through the end of the program

Have fun...

200	01EE
400	0435
700	06BE
1000	0986
1300	0E06
1500	1107
1800	1503
8000	18A5
17000	1C27
63005	1F4D
END	25EA

The listing:

```
10 ' HEXERCISER
20 ' COPYRIGHT (C) 1982 J.J. SCH
MIDT
30 ' ALL RIGHTS RESERVED
35 CLS
40 GOSUB20000
50 GOSUB10000
100 CLS:PRINT"     H E X A D E C
 I M A L"
110 PRINT
120 PRINT"HEXADECIMAL OR 'HEX' A
S IT IS"
130 PRINT"USUALLY CALLED IS A BA
SE 16"
140 PRINT"NUMBER SYSTEM ADOPTED
BY MOST"
150 PRINT"COMPUTER SYSTEMS AS A
HANDY WAY"
160 PRINT"TO DEAL WITH THE ARCHI
TECTURE"
170 PRINT"OF COMPUTERS THAT USE
THE 8 BIT"
180 PRINT"BYTE AS A UNIT OF STOR
AGE.":PRINT
190 PRINT"THE BYTE HAS 8 BITS.
EACH BIT"
200 PRINT"CAN HAVE A VALUE OF '0
' OR '1'"
210 PRINT"'0'='OFF' AND '1'='ON'
.
220 PRINT"          <ANY KEY>"
230 P$=INKEY$:IF P$="" THEN 230
235 SOUND234,1
240 CLS:PRINT"THE BYTE LOOKS LIK
```

```
E THIS:":PRINT
250 PRINT"POS-> 7  6  5  4  3  2
  1  0"
260 PRINT"BIT-> X  X  X  X  X  X
  X  X"
270 PRINT"VAL->128-64-32-16-8--4
--2--1"
280 PRINT"
290 PRINT"EACH X REPRESENTS A BI
T IN"
300 PRINT"THE BYTE AND THEY ARE
NUMBERED"
310 PRINT"FROM 0 TO 7 AND FROM R
IGHT TO"
320 PRINT"LEFT.  BY ADDING THE V
ALUES"
330 PRINT"OF THE 'ON' BITS, IT C
AN"
360 PRINT"HOLD ANY VALUE FROM 0-
255."
370 PRINT"           <ANY KEY>"
380 P$=INKEY$:IF P$="" THEN380
385 SOUND234,1
390 CLS:PRINT"HERE IS A DEMO OF
THIS."
400 PRINT"ENTER ANY VALUE FROM 0
 TO 255"
410 PRINT"AND I'LL SHOW YOU HOW
IT LOOKS"
420 PRINT"IN A BYTE."
430 INPUT"(0 TO 255)";A
440 IF A<256 THEN GOSUB 8000 ELS
E GOTO 430
445 PRINT:PRINT:PRINT
550 PRINT"POS-> 7  6  5  4  3  2
  1  0"
560 PRINT"BIT-> X  X  X  X  X  X
  X  X"
570 PRINT"VAL->128-64-32-16-8--4
--2--1"
600 IF B(1)=1 THEN POKE 1318,49E
LSE POKE 1318,48
610 IF B(2)=1 THEN POKE 1321,49
ELSE POKE 1321,48
620 IF B(3)=1 THEN POKE 1324,49
ELSE POKE 1324,48
630 IF B(4)=1 THEN POKE 1327,49
ELSE POKE 1327,48
640 IF B(5)=1 THEN POKE 1330,49
ELSE POKE 1330,48
650 IF B(6)=1 THEN POKE 1333,49
ELSE POKE 1333,48
660 IF B(7)=1 THEN POKE 1336,49
ELSE POKE 1336,48
670 IF B(8)=1 THEN POKE 1339,49
ELSE POKE 1339,48
675 PRINT"AGAIN???"
680 P$=INKEY$:IFP$=""THEN680
685 IFP$<>"Y"ANDP$<>"N"THEN680
690 SOUND234,1
695 IFP$="Y"THEN390
700 CLS:PRINT"SO MUCH FOR THE BY
TE."
710 PRINT"ONWARD WITH HEX.":PRIN
T
720 PRINT"JUST AS A BYTE CAN CON
TAIN ANY"
730 PRINT"VALUE FROM 0 TO 255 (2
56 VALUES) -- DON'T FORGET 0 --"
740 PRINT"HEX NEEDS TO REPRESENT
 16"
750 PRINT"VALUES, I.E. 0 TO 15."
760 PRINT"SINCE DECIMAL HAS ONLY
 10"
770 PRINT"SYMBOLS FOR NUMBERS (0
-9),"
780 PRINT"HEX EXTENDED THE SYMBO
LS BY"
790 PRINT"ADDING A THRU F TO 0 T
HRU 9."
800 PRINT"           <ANY KEY>"
810 P$=INKEY$:IFP$=""THEN810
815 SOUND234,1
820 CLS:PRINT"HERE ARE THE SYMBO
LS:":PRINT
830 PRINT"HEX SYMBOL-> 0  1  2
3  4"
840 PRINT"VALUE IS  -> 0  1  2
3  4":PRINT
850 PRINT"HEX SYMBOL-> 5  6  7
```

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```
8  9"
860 PRINT"VALUE IS  -> 5  6  7
8  9":PRINT
870 PRINT"HEX SYMBOL->  A   B
C"
880 PRINT"VALUE IS  -> 10  11  1
2":PRINT
890 PRINT"HEX SYMBOL->  D   E
F"
900 PRINT"VALUE IS  -> 13  14  1
5":PRINT
1000 PRINT"              <ANY KEY>
"
1010 P$=INKEY$:IFP$=""THEN1010
1015 SOUND234,1
1020 CLS:PRINT"JUST AS ANY OTHER
 BASE"
1030 PRINT"(10 OR 2 OR??) HEX CA
N BE"
1040 PRINT"ADDED-SUBTRACTED-MULT
IPLIED"
1050 PRINT"DIVIDED OR CONVERTED
TO "
1060 PRINT"SOME OTHER NUMBER BAS
E."
1070 PRINT"USUALLY, ONLY ADD & S
UB ARE"
1080 PRINT"USED FOR MOST COMPUTE
R WORK."
1090 PRINT"HOWEVER CONVERSION IS
 A MUST."
1100 PRINT"ASSEMBLERS, MONITORS
AND OTHER"
1110 PRINT"UTILITIES DISPLAY AND
 USE HEX."
1120 PRINT"TWO HEX 'NUMBERS' CAN
 REPRESENT"
1130 PRINT"ANY BIT COMBINATION T
HAT A BYTE"
1140 PRINT"MAY HOLD.  $00 - $FF
= 0 - 255."
1150 PRINT"             <ANY KEY>"
1160 P$=INKEY$:IFP$=""THEN1160
1165 SOUND234,1
1170 CLS:PRINT"HERE IS A DEMO OF
 COUNTING"
1180 PRINT"IN HEX."
1182 PRINT"PRESS 'P' TO PAUSE TH
E DISPLAY"
1183 PRINT"PRESS 'R' TO RESUME"
1185 PRINT"PRESS 'X' TO EXIT"
1190 FOR I=0TO255
1200 PRINT@195,"--DEC--        --
HEX--":PRINT
1205 B$=HEX$(I)
1210 PRINT@227," ";I
1212 PRINT@244,B$
1215 FOR II=1TO500:NEXT
1217 P$=INKEY$:IF P$="P" THEN GO
SUB 15000
1218 IF P$="X"THEN 1230
1220 NEXT
1230 CLS:PRINT"DID YOU NOTICE TH
AT WHEN"
1240 PRINT"THE RIGHT POSITION OF
 THE HEX"
1250 PRINT"NUMBER REACHED 'F' TH
AT A CARRY"
1260 PRINT"OCCURRED?  HEX 10, TH
E"
1270 PRINT"NUMBER AFTER HEX F, W
AS THE"
1280 PRINT"RESULT OF THE SAME CA
RRY THAT"
1290 PRINT"OCCURS IN DECIMAL FRO
M 9 TO 10."
1300 PRINT"OF COURSE HEX 10 = DE
CIMAL 16."
1310 PRINT"ADDING 1 TO HEX F (DE
C 15)"
1320 PRINT"GIVES HEX 10 (DEC 16)
.":PRINT
1330 PRINT"NOW ON TO ADD & SUBTR
ACT IN HEX.":PRINT
1340 PRINT"              <ANY KEY
>"
1350 P$=INKEY$:IFP$=""THEN1350
1355 SOUND234,1
1360 CLS:PRINT"THE BEST WAY TO L
EARN HOW"
```

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```
1370 PRINT"TO ADD/SUB IN HEX IS
TO WATCH"
1380 PRINT"SOMEONE WHO KNOWS HOW
.  IN"
1390 PRINT"OUR CASE THAT 'SOMEON
E' IS"
1400 PRINT"THE COMPUTER.  HERE I
S A DEMO"
1410 PRINT"OF ADD/SUB THAT LETS
YOU TRY"
1420 PRINT"FOR THE ANSWER BEFORE
 THE"
1430 PRINT"COMPUTER ANSWERS.":PR
INT
1440 PRINT"             <ANY KEY>"
1450 P$=INKEY$:IFP$=""THEN1450
1455 SOUND234,1
1460 CLS:PRINT"ADDITION <A> OR S
UBTRACTION <S>?"
1470 AS$=INKEY$:IFAS$=""THEN1470
1475 IF AS$<>"A" AND AS$<>"S"THE
N1470
1477 SOUND234,1
1480 GOSUB16000
1482 PRINT"PRESS 'A' FOR ANSWER"
:PRINT
1490 IF AS$="A" THEN PRINT"A D D
 I T I O N" ELSE PRINT"S U B T R
 A C T I O N"
1495 PRINT
1500 PRINT"FIRST FACTOR--->"N1$:
PRINT
1510 PRINT"SECOND FACTOR-->"N2$
1515 PRINT"                ------
"
1517 Q$=INKEY$:IFQ$=""THEN1517
1518 IFQ$<>"A"THEN1517
1519 SOUND234,1
1520 PRINT"ANSWER IS------>"A1$
1530 PRINT"AGAIN???"
1540 Q$=INKEY$:IFQ$=""THEN1540
1550 IFQ$<>"Y" AND Q$<>"N"THEN15
40
1555 SOUND234,1
1560 IFQ$="Y"THEN 1460
1570 CLS:PRINT"HOW DID YOU DO?
IF THE"
1580 PRINT"ANSWER IS SOMETHING L
ESS THAN"
1590 PRINT"GREAT, DON'T GIVE UP!
  HEX IS,"
1600 PRINT"AFTER ALL, NOT NATURA
L TO US"
1610 PRINT"WITHOUT 16 FINGERS (O
R TOES)."
1620 PRINT"THIS NEXT SECTION WIL
L HELP."
1630 PRINT"NOW WE ENTER THE BRAV
```

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```
E NEW "
1640 PRINT"WORLD OF CONVERSION."
1650 PRINT"WE COCO OWNERS ARE BL
ESSED"
1660 PRINT"WITH COMPUTERS THAT W
ILL DO"
1670 PRINT"CONVERSION FOR US.  M
ANUAL"
1680 PRINT"CONVERSION IS A TAD D
IFFICULT"
1690 PRINT"WITHOUT CONVERSION CH
ARTS OR"
1700 PRINT"OR SOME OTHER AID."
1710 PRINT"              <ANY KEY>
"
1720 P$=INKEY$:IF P$=""THEN1720
1725 SOUND234,1
1730 CLS:PRINT"SO, IF YOU HAVEN'
T ALREADY"
1740 PRINT"DONE SO...":PRINT
1750 PRINT"MEET (FANFARE PLEASE)
:":PRINT
1760 PRINT"          HEX$(?)":PR
INT
1770 PRINT"AND       &H????":PRI
NT
1780 PRINT"THE COMMAND: ? HEX$(1
234)"
1790 PRINT"WILL RETURN THE HEX V
ALUE FOR"
1800 PRINT"THE DEC NUMBER IN THE
 ().":PRINT
1810 PRINT"              <ANY KEY>
"
1820 P$=INKEY$:IFP$=""THEN1820
1825 SOUND234,1
1830 CLS:PRINT"THE COMMAND: ? &H
ABCD WILL"
1840 PRINT"RETURN THE DEC VALUE
FOR THE"
1850 PRINT"HEX NUMBER AFTER THE
'H'.":PRINT
1860 PRINT"LET'S TRY SOME CONVER
SIONS.":PRINT
1870 PRINT"<H>EX TO DEC OR <D>EC
 TO HEX?"
1880 Q$=INKEY$:IF Q$=""THEN1880
1890 IF Q$<>"H" AND Q$<>"D" THEN
1880
1895 SOUND234,1
1900 IF Q$="H" THEN GOSUB 17000E
LSE GOSUB18000
1910 PRINT"AGAIN???"
1920 Q$=INKEY$:IFQ$=""THEN1920
1930 IFQ$<>"Y"ANDQ$<>"N"THEN1920
1935 SOUND234,1
1940 IFQ$="Y"THEN 1830
1950 PRINT"              <ANY KEY>
"
2000 Q$=INKEY$:IFQ$=""THEN2000
```

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```
2010 CLS:PRINT"REVIEW MENU:":PRI
NT
2020 PRINT"ENTER-":PRINT
2030 PRINT"1-ENTIRE HEXERCISER":
PRINT
2040 PRINT"2-FROM COUNTING SECTI
ON":PRINT
2050 PRINT"3-FROM ADD/SUB SECTIO
N":PRINT
2060 PRINT"4-FROM CONVERSION SEC
TION":PRINT
2070 PRINT"5-END HEXERCISER":PRI
NT
2080 PRINT"YOUR CHOICE ???"
2090 Q$=INKEY$:IF VAL(Q$) <>1 AN
D VAL(Q$)<>2 AND VAL(Q$)<>3 AND
VAL(Q$)<>4 AND VAL(Q$)<>5 THEN 2
090
2092 Q=VAL(Q$)
2100 ON Q GOTO 2110,1170,1460,18
60,2120
2105 GOTO 2100
2110 RUN
2120 END
7900 STOP
7999 STOP
8000 H=A:B(1)=0:B(2)=0:B(3)=0:B(
4)=0:B(5)=0:B(6)=0:B(7)=0:B(8)=0
9000 IF A=>128 THEN B(1)=1
9010 IF B(1)=1 THEN A=A-128
9020 IF A=>64 THEN B(2)=1
9030 IF B(2)=1 THEN A=A-64
9040 IF A=>32 THEN B(3)=1
9050 IF B(3)=1 THEN A=A-32
9060 IF A=>16 THEN B(4)=1
9070 IF B(4)=1 THEN A=A-16
9080 IF A=>8 THEN B(5)=1
9090 IF B(5)=1 THEN A=A-8
9100 IF A=>4 THEN B(6)=1
9110 IF B(6)=1 THEN A=A-4
9120 IF A=>2 THEN B(7)=1
9130 IF B(7)=1 THEN A=A-2
9140 IF A=1 THEN B(8)=1
9150 RETURN
10000 CLS:PRINT@102,"H E X E R C
 I S E R"
10010 PRINT@232,"COPYRIGHT (C) 1
982"
10020 PRINT@264,"JAMES J. SCHMID
T
10030 PRINT@296,"196A ARLENE CT.
10040 PRINT@328,"WHEELING, IL. 6
0090
10050 FOR I=1TO1500:NEXT:RETURN
15000 R$=INKEY$:IF R$="R" THEN R
ETURN ELSE 15000
16000 N1=RND(32000):N2=RND(16000
)
16010 IF N1<N2 THEN S1=N1:N1=N2:
N2=S1:S1=0
```

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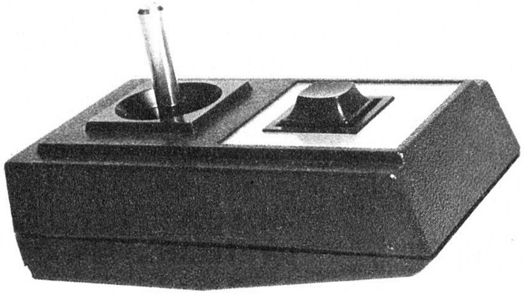

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REVIEWED
OCT. 1982

80 MICRO
REVIEWED
MARCH 1983

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```
16015 IF AS$="S"THEN16030
16020 N1$=HEX$(N1):N2$=HEX$(N2):
A1$=HEX$(N1+N2)
16025 GOTO16040
16030 N1$=HEX$(N1):N2$=HEX$(N2)
A1$=HEX$(N1-N2)
16040 IF LEN(N1$)<4 THEN N1$=STR
ING$(4-LEN(N1$),"0")+N1$
16050 IFLEN(N2$)<4 THEN N2$=STRI
NG$(4-LEN(N2$),"0")+N2$
16060 IFLEN(A1$)<4 THEN A1$=STRI
NG$(4-LEN(A1$),"0")+A1$
16070 RETURN
17000 INPUT"ENTER HEX NUMBER";H$

17010 HH$="&H"+H$
17020 PRINT"ANSWER->";VAL(HH$)
17030 RETURN
18000 INPUT"ENTER DEC NUMBER";D
18010 DD$=HEX$(D)
18020 PRINT"ANSWER->";DD$
18030 RETURN
20000 'ENTRY POINT FOR SCREEN
63001 DATA159,159,023,008,001,02
0,159,020,008,005,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63002 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63003 DATA159,159,159,159,159,15
9,159,159,255,159,159,255,159,25
5,255,255,255,159,255,159,159,15
9,255,159,159,159,159,159,159,15
9,159,159
63004 DATA159,159,159,159,159,15
9,159,159,255,159,159,255,159,25
5,159,159,159,159,159,255,159,25
5,159,159,159,159,159,159,159,15
9,159,159
63005 DATA159,159,159,159,159,15
9,159,159,255,255,255,255,159,25
5,255,255,159,159,159,159,255,15
9,159,159,159,159,159,159,159,15
9,159,159
63006 DATA159,159,159,159,159,15
9,159,159,255,159,159,255,159,25
5,159,159,159,159,159,255,159,25
5,159,159,159,159,159,159,159,15
9,159,159
63007 DATA159,159,159,159,159,15
9,159,159,255,159,159,255,159,25
5,255,255,255,159,255,159,159,15
9,255,159,159,159,159,159,159,15
9,159,159
63008 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
```

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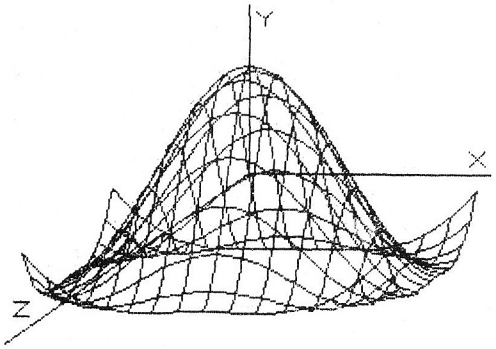

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```
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63009 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63010 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,009,019,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63011 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63012 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63013 DATA159,159,159,159,159,00
8,159,005,159,024,159,001,159,00
4,159,005,159,003,159,009,159,01
3,159,001,159,012,159,159,159,15
9,159,159
63014 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63015 DATA159,159,159,159,159,15
9,063,159,063,159,063,159,063,15
9,063,159,063,159,063,159,063,15
9,063,159,063,159,159,159,159,15
9,159,159
63016 DATA159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159,159,159,159,159,159,15
9,159,159
63017 PS=1:L=1:BB=1024:EB=1055
63018 FOR OL=1TO16
63019 FOR IL=BB TO EB
63020 READ BY$
63021 POKEIL,VAL(BY$)
63022 PS=PS+3
63023 NEXT
63024 EB=EB+32:BB=BB+32:PS=1:L=L
+1
63025 NEXT
63026 PLAY"V20"
63028 FORX=1TO20
63029 PLAY "L255;A;P55;A;P55;A;P
55;A;P55;A;P55;A;A;A;V-"
63031 NEXT
63032 RETURN
```

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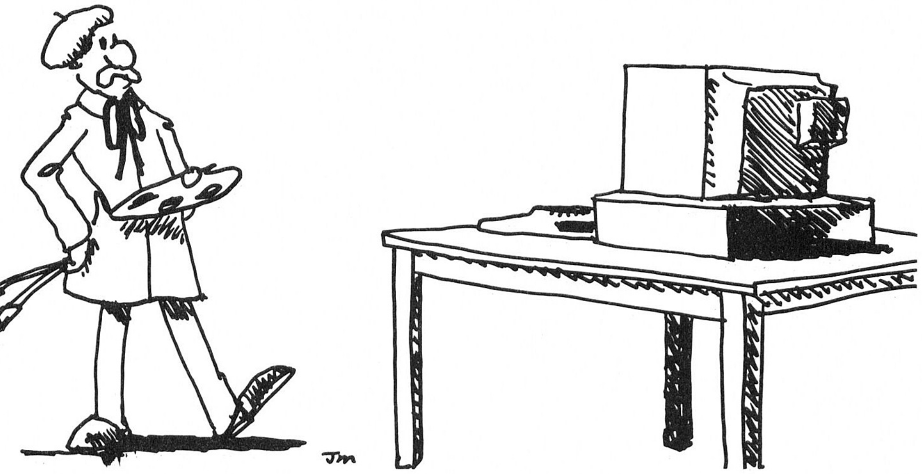
Three Easy Pieces: One Animator's Art

By Stephen Lai



Once I had learned the art of animation, which on my part took much more effort than simply reading the material included about it in the CoCo manuals, I wondered how I could apply it to produce beautiful moving graphics. My father came up with the idea of using the *SIN/COS* functions which, as you will see, solved the question asked above.*

In these three programs, I use the command *PMODE 1*, which allows for the maximum use of four graphic pages on the 16K CoCo. All three programs have X number of lines, curves or leaves protruding from the midpoint of the screen. To find the number of degrees a figure rotates at every flip of a page, use this formula: 360/(number of lines, leaves, or curves x 4).

When a program is typed in and *RUN*, the computer prompts you with the question, "ARE THE PAGES DRAWN?" (Y/N). If they are drawn, only input "Y" if you want to see the same display again. Next, you are asked for the number (#) of lines or leaves.

The two processes these programs consist of are the drawing process and the display process. The drawing process goes through the four pages, one by one, producing a figure differing from the figures on the other pages by a number of angles. This process varies in time taken according to the number of lines, leaves or curves and the specific program. After that lengthy process is finished, the real impressive stuff flashes across the screen, but not before you *INPUT* a delay speed.

Enough for the general; now for the specifics.

Revolver is the most basic of all three programs. The display is similar to the spokes of a wheel. A good first input would be 15 for the number of lines and 20 for delay speed. *Twirlers* is the most fancy and impressive of the programs. The leaves are of random width and color. Four mini-twirlers are at the corners of the screen. The drawing process is very lengthy, so have a magazine ready to flip through while the program gets ready to do its flipping. A sound will inform you that the drawing process is done. During the display process, you can cause the figures to rotate in the opposite direction by pressing the letter "C." A good starting input would be 3 for number of leaves and 30 for rotating speed.

Spinner needs no inputs for number of curves or rotating speed. There are always four curves and the rotating speed changes throughout the display process getting faster to a certain point, then slower to a certain point, then faster, slower, etc.

The three programs use the *POKE* 65495,0 and *POKE* 65494,0 commands, which must be deleted to be run on some older CoCos.

> * Editor's note: For an in-depth discussion of the technique, using sine/cosine functions, refer to Don Inman's *Using Graphics* column in the March 1983 issue of *Rainbow*.

70	00FF
End	01D1

The listing:

```
1 '              REVOLVE
2 '          BY STEPHEN LAI
3 '              (C) 1982
10 CLS:INPUT"ARE PAGES DRAWN (Y/
N)";Z$:IFZ$="N"THENGOTO150ELSEGO
TO130
20 INPUT"NUMBER OF LINES";N:PMOD
E1,1:PCLS:SCREEN1,0
30 PI=3.14159
40 POKE65495,0
50 FORP=0TO3:PMODE1,(P+1)*2-1:PC
LS:SCREEN1,0
60 B=P*PI/(N*2)
70 FORL=1TON
80 X=-25*PI
90 Y=SIN(X/25)
100 R=SQR(X^2+Y^2):AA=ATN(Y/X)+B
:H=R*COS(AA):V=R*SIN(AA)
110 LINE(126,96)-(H+126,V+96),PS
ET
120 B=B+2*PI/N:NEXTL,P
130 INPUT"DELAY SPEED";S
140 FORP=1TO7STEP2:PMODE1,P:SCRE
```

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```
EN1,0:FORDLAY=1TOS:NEXTDLAY,P:GO
TO140
150 PCLEAR8:GOTO20
```

110	01B7
End	0356

```
1 '           TWIRLERS
2 '        BY STEPHEN LAI
3 '           (C) 1982
10 CLS:INPUT"ARE PAGES DRAWN (Y/
N)";Z$:IFZ$="N"THENGOTO240ELSEGO
TO160
20 INPUT"NUMBER OF LEAVES";N:PMO
DE1,1:PCLS:SCREEN1,0
30 C1=RND(3)+1:C2=RND(3)+1:C3=RN
D(3)+1:C4=RND(3)+1:C5=RND(3)+1:E
=1+RND(20)*.1
40 PI=3.14159
50 POKE65495,0
60 FORP=0TO3:PMODE1,(P+1)*2-1:CO
LORC2,1:PCLS:SCREEN1,0
70 B=P*PI/(N*2)
80 FORL=1TON
90 FORX=-25*PI TO25*PI STEP2
100 D=X/E:Y=D*SIN(X/25)
110 R=SQR(X^2+Y^2):AA=ATN(Y/X)+B
:H=R*COS(AA):V=R*SIN(AA)
120 IFX=-25*PI THENGOSUB190
130 PSET(H+126,V+96,C1):NEXT
140 B=B+2*PI/N:NEXTL,P
150 SOUND1,40
160 INPUT"DELAY SPEED";S
170 FORP=1TO7STEP2:PMODE1,P:SCRE
EN1,0:FORDLAY=1TOS:IFINKEY$="C"T
HEN180ELSENEXTDLAY,P:GOTO170
180 FORP=7TO1STEP-2:PMODE1,P:SCR
EEN1,0:FORDLAY=1TOS:IFINKEY$="C"
THEN170ELSENEXTDLAY,P:GOTO180
190 CIRCLE(H/4+208,V/4+150),10,C
3
200 LINE(48+(-H/3.5)-4,150+(V/3.
5)-4)-(48+(-H/3.5)+4,150+(V/3.5)
+4),PSET,BF
210 CIRCLE(-H/6+48,V/6+24),2,C4:
CIRCLE(H/4+48,V/4+24),2,C5
220 LINE(208,24)-(208-H/4,24+V/4
),PSET
230 RETURN
240 PCLEAR8:GOTO20
```

70	0109
End	0219

```
1 '         SPINNER
2 '      BY STEPHEN LAI
3 '         (C) 1982
10 GOTO170
20 N=0:L=75:C=RND(3)+1:D=RND(40)
+10:PI=3.14159
30 CLS:INPUT"ARE PAGES DRAWN (Y/
N)";Q$:IFQ$="N"THEN40ELSEGOTO110
40 F=1:FORN=1TO7STEP2:PMODE 1,N:
SCREEN1,0:PCLS
45 POKE65495,0
50 FORX=-25*PI TO0STEP2
70 X1=X/25:Y=D*SIN(X1)
80 R=SQR(X^2+Y^2):A=ATN(Y/X):B=A
+N*(PI/16):H=R*SIN(B):V=R*COS(B)
90 PSET(V+126,-H+96,C):PSET(-H+1
26,-V+96,C):PSET(H+126,V+96,C):P
SET(-V+126,H+96,C)
100 NEXTX,N
110 I=-2:L=50
120 FOR A=7TO1STEP-2:PMODE1,A:SC
REEN1,0
130 SOUND 225-4*L,1
140 FOR DLAY=1 TO L:NEXT DLAY,A
150 L=L+I:IFL<5ORL>50THENI=-I
160 GOTO120
170 PCLEAR8:GOTO20
```

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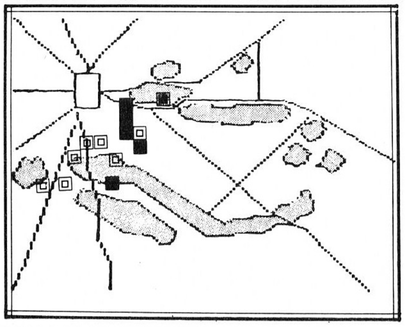
OR DIE!

16K ext.
joystick



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Software Review . . .

***Preschool Packs:* Simple, Solid, Successful**

Preschool Packages 1,2, and 3, from Computer Island, are designed to teach kids in a fun and simple game format. Some of the programs in this collection are more successful at this than others.

PRESCHOOL PACK 1, CLOWN AND FISH NUM

In *Clown,* a face appears under one of five triangles. The child counts across to find the number of the triangle and then presses the number on the keyboard. If incorrect, a sad sound is heard and the child then has a chance to try again. When correct, a happy sound is heard and then a new "problem" is set-up. Number recognition and counting skills are reinforced by the use of this program.

In *Fish Num,* a random number of fish (1-10) appear on the screen with the spelling of the number of fish above the display. The child figures out how many fish are on the screen, (by word recognition or by counting), and presses the corresponding number on the keyboard. If wrong, you hear the sad sound. A correct answer receives a happy sound and spells out the correct answer. This program reinforces number recognition and counting skills and introduces spelling.

The games, sounds, and graphics are all very simple in package number 1.

PRESCHOOL PACK 2, COUNT KIDS AND ADD PENNY

In *Count Kids,* a random number of kids' faces appear on the screen. The child counts the kids and presses the corresponding number. A wrong answer receives a sad sound, a correct answer a happy sound. Of the whole group, this program has the most interesting graphics and is the most entertaining for children. With this program, counting scattered objects as well as number recognition are reinforced.

Add Penny draws large pictures of pennies in two rows. This is set up in the same format in which beginning addition is presented in school. The child counts the pennies and presses the corresponding key. Once again, wrong answers receive a sad sound, correct answers receive a happy tune. This program reinforces counting and number recognition and sets the stage for teaching addition in the future.

PACKAGE 2 has the best graphics and sounds of the group.

PRESCHOOL PACK 3, ALPHA-BYTE

Alpha-byte consists of three programs, each covering a portion of the alphabet, to help preschoolers recognize the letters of the alphabet. All three are played in the same way. The letters covered by the particular program are displayed on the screen. The program then draws one of the letters again under the corresponding letter already displayed. The child then presses the appropriate key that matches the letter. The usual sad and happy sounds accompany wrong and correct answers. The child need not know the alphabet in order to play, but can just match shapes and symbols.

This third package is less interesting, both in play and in graphics.

All the programs in these three packages are easy for small children to play on their own without adult help. All answers are single key inputs, meaning that you don't use the *ENTER* key. There is no time limit on any of these games. Children may play for a long as they wish, using the *BREAK* key to end the program when done. However, there is also no score or identification of which problems the child has trouble with.

Of the three packages, pack 2 is definitely the best. It is the most interesting for small children to play and has the most appealing graphics. All are in 16K ECB.

These games lack the "extras," but are perhaps more suitable for preschoolers because of it. They are all simple and unsophisticated games at a good price.

(Computer Island, Dept. R, 227 Hampton Green, Staten Island, NY 10312, Preschool Packs 1, 2, 3 @ $11.95)

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PATCHing The Patch: EDTASM+ To Disk Revisited

By Roger Schrag

In the December issue of *the Rainbow,* an article that I wrote showing how to patch Radio Shack's EDTASM+ to use disk appeared. Since then, I have gotten letters from various readers who were worried that they might have made a mistake because the "L" and "P" commands of Zbug wouldn't work properly. I would like now to explain that this is because the patch program as presented in the December *Rainbow* simply does not support the functions of Zbug. I have since modified the program slightly, and I would like to share my revisions with you.

First, let me say that if you have any problems, comments, or questions you may drop me a line at 2504 Manning Avenue, Los Angeles, California 90025. A self-addressed, stamped envelope would be helpful. I will do my best to reply promptly.

If you have patched your EDTASM+ to use disk and would like to see Zbug also support disk, then read on! The process is really quite simple. First insert the disk cartridge and turn on your computer. Now dig out your source code for the program shown in the December article. If it is still on tape, transfer it to disk with the BASIC transfer program.

Next, load disk EDTASM+ and the old source code. If you used the same line numbering scheme that I did, then line 189 should be the end statement. Delete it. Now insert all of the code in the listing presented here from line 189 on.

If you didn't hold on to your scource code from the December article, then you will need to load disk EDTASM+ and enter that listing first.

Whether you have updated your old source code or reentered the whole thing from scratch, double check for typographical errors. Then save the new source code on disk. Assemble it to disk as well.

Now, return to Disk BASIC. Load your present copy of disk EDTASM+, but don't execute it. Now load the new patch program that you just assembled. Finally, save the new finished product on disk with the command SAVEM"EDTASM+",&HE80,&H37FF,&HE80.

You now own the revised version of disk EDTASM+. To save a block of memory onto disk from Zbug, type "P", then the start-address, end-address, execution-address and press *ENTER*. You will be prompted for the filename. Type it in as you would in BASIC, but without the quotes. If you don't specify an extension, none will be assumed. Your block of memory will then be written to disk.

To load a file under Zbug, simply press L and *ENTER*. You will be asked for the filename, and the file will be loaded. By the way, Zbug has the ability to load a file into memory offset. I believe Radio Shack forgot to put this in the manual. If you want to load a file offset, then use this mickey mouse syntax: L XYZ offset. The XYZ is needed to keep the Zbug command evaluator from getting confused.

Finally, there is a patch to cure a problem with the Reset button. When you hit Reset, the SAM chip in the computer resets the interrupt control register. A patch is therefore needed to reprogram this register whenever Reset is pressed.

Incidentally, if you are wondering how the new Zbug patches work, they utilize the ROM routines that normally process the *LOADM* and *SAVEM* statements in BASIC.

That about rounds out the revisions to disk EDTASM+. I hope you will find my work helpful. Please feel free to drop me a line if you are having difficulties, or if you have any suggestions.

The listings:

```
00189 *
00190 *
00191 *NEW MATERIAL ADDED TO MAKE ZBUG
00192 *DISK COMPATIBLE, AND TO CURE A
00193 *FEW MINOR BUGS
00194 *
```

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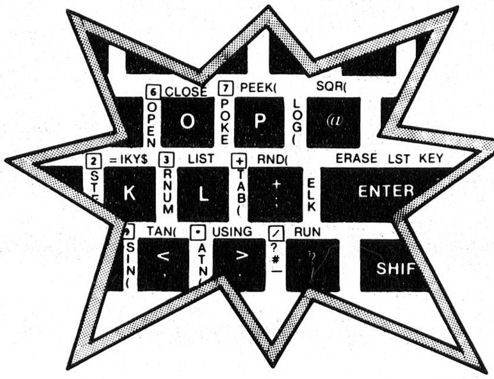

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```
00195 *REVISION 1 - 01/19/83
00196 *
00197 *
00198 *CLOSE FILES & RETURN TO ZBUG
00199 ZCLOSE  JSR     $CA3B   CLOSE FILES
00200         JMP     $1387   RETURN TO ZBUG
00201 *
00202 *
00203 *ROUTINE TO REINITIALIZE THE
00204 *SAM CHIP CORRECTLY AFTER
00205 *RESET IS PRESSED
00206 RESET   LDA     #$35    FIX INTERRUPT
00207         STA     $FF03   CONTROL REGISTERS
00208         LDA     #$34    OF THE SAM CHIP
00209         STA     $FF23   THEN RETURN TO
00210         JMP     $3270   EDTASM+ RESET ROUTINE
00211 *
00212 *
00213 *MAKE SURE THE DISK FILE IS CLOSED
00214 *WHEN ZBUG IS DONE WITH IT
00215         ORG     $2D88
00216         JSR     ZCLOSE
00217 *
00218 *
00219 *PATCH INTO THE RESET ROUTINE
00220         ORG     $326B
00221         JMP     RESET   JUMP TO THE PATCH
00222 *
00223 *
00224 *FIX INPUT ROUTINE SO THAT IF YOU
00225 *RESPOND TO "FILENAME?" PROMPT BY
00226 *HITTING BREAK, YOU WON'T ACCIDENTALLY
00227 *RETURN TO THE EDITOR
00228         ORG     $1EF0
00229         LBEQ    $172F
00230 *
00231 *
00232 *MAKE ZBUG'S "P" COMMAND WRITE
00233 *TO DISK, BY USING THE ROM ROUTINE
00234 *THAT PROCESSES THE BASIC
00235 *COMMAND "SAVEM"
00236         ORG     $16C9
00237         JMP     $CEA2   GO TO ROM ROUTINE
00238 *
00239 *
00240 *MAKE ZBUG'S "L" COMMAND LOAD
00241 *FROM DISK, BY USING THE ROM ROUTINE
00242 *THAT PROCESSES THE BASIC
00243 *COMMAND "LOADM"
00244         ORG     $1641
00245         LDU     #LOAD   GET THE FILENAME
00246         JSR     $15C9   & OPEN IT FOR INPUT
00247         PULS    X       GET THE OFFSET
00248         STX     >$D3    AND STORE IT
00249         PSHS    DP      SAVE DP
00250         CLRA            CLEAR THE
00251         TFR     A,DP    DIRECT PAGE
00252         JSR     $CF07   USE ROM ROUTINE
00253         PULS    DP,PC   RESTORE DP & RETURN
00254         END     START
```

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TRS-80 Programmers Sourcebook, First edition, a 67-page (8½ x 11), soft-cover book featuring listings for application software, reference publications and computer clubs. Edited by J. Bradley Flippen, OCEAN, P.O. Box 2331, Springfield, VA 22152, $4.95.

Basic Programming Primer, a new, expanded second edition, 368-page ringbound soft cover, (9 x 6½), primer for those who want to learn BASIC. Written by Mitchell Waite and Michael Pardee. Published by Howard W. Sams & Co. Inc., P.O. Box 7092, Indianapolis, IN 46206, $17.95.

Pro-Color File,Version 2.0, 32K disk system. The 2.0 version is being sold for $79.95; however, owners of the 1.0 version should have already received letters offering the new version for a $20.00 upgrade fee, which includes a new manual and diskette. Available from Derringer Software, P.O. Box 5300, Florence, SC 29501

Super-Pro Replacement Keyboard Kit, a direct replacement professional keyboard kit for CoCo and the TDP-100. It has the same key layout as your original keyboard. Mark Data Products, 24001 Alicia Pkwy., No. 226, Mission Viejo, CA 92691, $69.95.

Dynacalc, an electronic spreadsheet program with a 41-page manual for Flex users. Sold by Computer Systems Center, 13461 Olive Blvd., Chesterfield, MO 63017, $200.

Spectran, a program written for the 16K or 32K Disk ECB. Allows you to translate *Spectaculator* files to ASCII, or vice versa. Available from Crimson Software, 32 Beverly Heights, Tuscaloosa, AL 35404, $25.

Church Contributions Program, software and 20-page manual package primarily designed to facilitate the task of recording envelope collections. Maintains its own data files. Available from Universal Data Research, Inc., 2457 Wehrle Dr., Buffalo, NY 14221, $99.

Single Entry Ledger, software and a 10-page manual. Designed to handle ledger entries for home and small businesses. Compatible with the company's Data Base Manager program. Also available from Universal Data Research, Inc., $95.

Balanced Billing Program, software and 15-page manual provide a menu-driven, billing package that maintains its own data files, provides reports, and prints invoices and mailing labels. Also available from Universal Data Research, Inc., $99.

Data Base Manager, software and manual for the TRS-80 Model III and CoCo. This program is designed to organize all your data and provide you with meaningful reports. Also available from Universal Data Research, Inc., Part I-$99., Part II-$99.

Moneypak, a 32K ECB learning program for home or school which enables youngsters to gain skill in using money and making purchases. Package includes play money and is available from Computer Island, 227 Hampton Green, Staten Island, NY 10312, $22.95.

Old McDonald's Farm Vowels, an educational vowel drill program for beginning readers through second grade. Requires 16K ECB. Available from Teksym Corp., 14504 Country Road 15, Minneapolis, MN 55441, $14.95.

Grand Slam Bridge, a 32K card game program. Available from Greentree Software, P.O. Box 97, Greenwood, IN 46142, cassette $19.95.

3-D Tic-Tac-Toe, a game for one player against CoCo, or two players against each other. More than 150 winning combinations. On cassette, 32K ECB, $14.95 or 32K disk $19.95. Available from Q Soft, 1006 Robinhood Drive, Painsville, OH 44077.

Zaxxon, an arcade-style game. Objective: you are a pilot of a fighter spacecraft on a mission to meet and destroy the deadly Zaxxon robot. Available from Data Soft, Inc., 9421 Winnetra Avenue, Chatsworth, CA 91311, cassette or diskette $39.95.

Zaksund, a "3-D color graphics," arcade style game in 32K machine language. Objective: fly your spaceship through enemy starbases and avoid guided missles, lasers, and firing turrents, and reach their leader—Zaksund. KORG Polysix Synthesies sound. Available from Elite Software, Box 11224, Pittsburgh, PA 15238, $24.95 cassette, $27.95 disk.

Deprec, Multiple Depreciation Analysis, a program that will calculate depreciation expense using various methods. Available from B. C. Engineering, P.O. Box 768, Manchester, MO 63011, $10.95.

Intrst I, Home Interest Calculator, a program that will calculate answers for various question about loans or money deposited in interest bearing accounts. Also available from B.C. Engineering, $12.95.

INSIMB, a 6809 machine code instruction simulator which uses about 8K. Together with *Insint* (included), will simulate all 6809 instructions. Also available from B. C. Engineering, $39.95.

Stock Option Strategies allows you to devise your own stock option strategies, covered options, straddles, calls and puts, percent gains and losses. Graphed in color. No data base is required. Menu driven, 16K cassette. Available from Greentree Software, P.O. Box 97, Greenwood, IN 46142, $14.95.

Doubleback, Graphics game for 4K and joysticks. One or two players. Accumulate points by circling an assortment of objects as they materialize on the screen. Challenge posed by rapidly fading trail and obstacles which suddenly appear in your path. Radio Shack Catalog No. 26-3091, $24.95.

The Sands of Egypt, an Adventure game with graphics. As you attempt to overcome the scorching elements of the desert, you try to find the treasure in as few moves as possible and claim the treasure. Radio Shack Catalog No. 26-3290, $29.95.

Color Disk Spectaculator, an electronic spreadsheet program that does forecasting, planning, budgeting and problem solving. Includes a 54-page manual divided into five parts. Radio Shack Catalog No. 26-3256, $59.95.

Personafile, is a central filing system for 16K or 32K ECB. It allows up to 540 records with up to 250 different subjects. Radio Shack Catalog No. 26-3260, $59.95.

***Color Disk* Scripsit,** word processing program. Lets you create correct-free letters, themes and reports. Radio Shack Catalog No. 26-3255, $59.95.

Madness & the Minotaur, a 16K Adventure game. You are a prisoner in the Labyrinth castle and are trying to escape from seven creatures with six treasures divided among them. Radio Shack Catalog No. 26-3313, $14.95.

TRS-80 Color Computer Quick Reference Guide, a 71-page ringbound, softcover (8½ x 3½), manual. Radio Shack Catalog No. 26-3194, $4.95.

Images II, a data tape packed with pictures for the programs *Art Gallery* and *Micro Painter*. Radio Shack Catalog No. 26-3301, $8.95.

Vocabulary Tutor I, an educational vocabulary program for ages 8-10. Uses pictures, text and recorded speech for the TRS-80. Radio Shack Catalog No. 26-2568, $8.95.

Color Graphic Printer Package, a series of programs including a bar graph and pie graph for use with Extended Color BASIC, the CPG-115 color printer and one joystick. Available from Dragonfly Software, 12503 Davan, Colesville, MD 20904, $18.

Game Package I, includes *Alien, Starship* and *MX Missile Peace Keeper.* ECB and one joystick. Available from Dragonfly Software, 12503 Davan, Colesville, MD 20904, $14.

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in *the Rainbow*. By awarding a *Seal,* the magazine certifies the program *does exist*, but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to *the Rainbow's* reviewers for evaluation.

—Jutta Kapfhammer

THE GREATEST SOFTWARE DEAL ON EARTH

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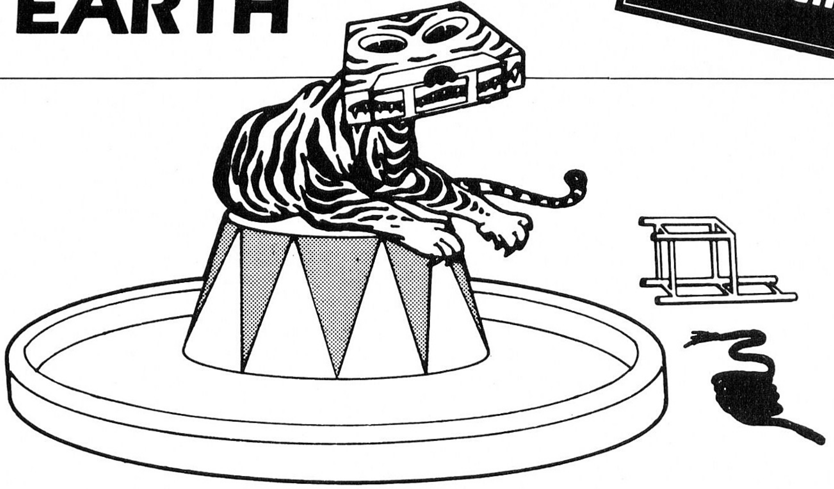

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	6 months (6 issues)	$30.00	North America — First Class postage included.
	Single Copies	$ 6.00	Overseas — add $10 to subscriptions and $1 to single copies. Sent AO rate.

The Fine Print: All issues from July 1981 available — ask for list. Programs are for the Extended BASIC model and occasionally for disks.

Chromasette MAGAZINE

P.O. Box 1087 Santa Barbara, CA 93102 (805) 963-1066 MasterCard/Visa

Let's Share Some Of Your Useful Hints

By Joseph Kolar
Rainbow Contributing Editor

Nobody has a monopoly on ideas! You may have found an easier, simpler or less expensive way to do something that may be of use to *Rainbow* readers. If it is not too advanced or complex, why not sit down and write up your hint, observation or innovation? Send it to me at 1706 Dickinson Street, Inverness, Florida, 32650. We, through *the Rainbow*, will share it with others beginners.

Let's pause and consider some hints and suggestions that you may, or may not, find useful.

Have you noticed all the good ideas and hints that appear in *the Rainbow*? Why not copy the ones that you feel are useful or interesting into your personal reference notebook? Never cut them out of *the Rainbow*. You will only be chopping up a good reference source. Copy the essence into your private reference notebook and if some of them are of doubtful value now but show promise for the future when you become more sure of yourself, why not reserve a page in your notebook, listing the jist of the hint, the page and issue of *the Rainbow*? Later on, as your horizons expand, you can easily locate and refer to it.

The information in *the Rainbow* never gets stale and for you recent beginners who have just subscribed to *the Rainbow*, it will be wise to consider purchasing the back issues. Now, that's a hint!

You have been having fun making up and saving some programs to tape. About every six months, after you have absorbed and digested new information and have advanced in ability, pull out and review some of the programs that you created. They need not be long and involved but they should be your own work.

You will discover that you have new insights and expanding awareness regarding your programming abilities and will see many ways to improve, enhance or expand your earlier works. So, what are you waiting for? Rework the program!

Two things will be verified: 1) the extent of your progress since you first created the program; and 2) your increased ability to utilize your new knowledge. In fact, you may have advanced far enough to say, "bye, bye, beginners!" and head for higher ground.

When you are making up a program, it is best to put in the REM after you are finished. You can tack REMS after individual lines to clarify what the line contains. Sometimes, in your REM you may refer to other line numbers. If you decide to RENUM the program lines, the *RENUM* feature will not change the line numbers in the REMs. Often, you forget to check the REMs and change the reference to line numbers. When running through the listing, those REMs will be incorrect, useless and confusing. So, make it a point to put in the REMs just before you put it on tape.

Let's say you have a cassette tape that contains many programs, your tape is positioned after the last entry, and you want to *CLOAD* the last program. You can avoid wasting time rewinding to the beginning and then fast forwarding by doing the following: 1) reset counter to 000; 2) subtract the ending number of the program from the program; 3) rewind until you get the counter back the required units. (Example: program is 14 units long. Add two, which results in 16. rewind to 984). Cload "XXX" *ENTER*. If you get an I/O message, it means you overrode the start of the program. Back up a few more digits and try again. Now you know one of the benefits of listing the ending counter number on the title card as well as leaving ample space between programs.

Be careful when going into the *EDIT* mode not to absentmindedly key in 1250 instead of *EDIT* 1250 and then press *ENTER*. This will delete line number 1250 and you will have nothing to edit. Likewise if you key in 1250 or 1250-1280 when you intended to key in *LIST* 1250 or *LIST* 1250-1280 and press *ENTER*, you will delete line number 1250 in both cases. You are likely to make these errors when in a frenzy of creativity your hand is quicker than your eye.

The only real solution is that when you key in *EDIT*, or *LIST* specific lines, you scan the entry before pressing *ENTER*. If you practice this cautionary action, you will soon make it an automatic response. This is one of those times when haste makes waste!

A similar error may occur when you are in the *EDIT* mode and want to press the "X" to get to the end of the line. You may press the "C" in error. Again, make it a point when pressing the "X" to see that you are really at the end of the line. Otherwise, you may wind up doing strange things to the line you are editing.

If you own a LPVII printer and use the screen print program (R.S. 26-3021), you may inadvertantly press the "shift" and "up arrow" while you are editing your listing and the printer is on. This will start your printer clacking away, creating an unwanted picture and wasting your time.

Happily, there is a solution available in your home. Search around the house for a bottle cap that is about the size that is on an aspirin tablet bottle. Some thimbles may fit. Break off the handle from a plastic coffee measure if it is the small size.

Just place the cap over the "up arrow" key and you can edit to your heart's content without worrying about pressing that no-no key.

Remember that spring-loaded clothespin that you use on the extended handle of your cassette player to hold work that you are copying? That clothes pin can also serve as a handy pencilholder. Just press the pencil between the two pieces. It will be held firmly and be ready for action whenever you are.

If you are using an improvised typing-stand as descripbed in the first article, you may find that many soft-covered books, as well as hard-covered books, will not stay open to a desired page. The pages have a tendency to flip over and lose your place.

You can solve this easily. Use the cardboard backing of an 8½ x 11 writing tablet, a piece of stiff corrugated cardboard, a piece of veneer plywood, plexiglass or some other suitable, thin-but-firm material.

Open your soft-covered book to the desired page, clip each side of the open book, at the upper right corner and the

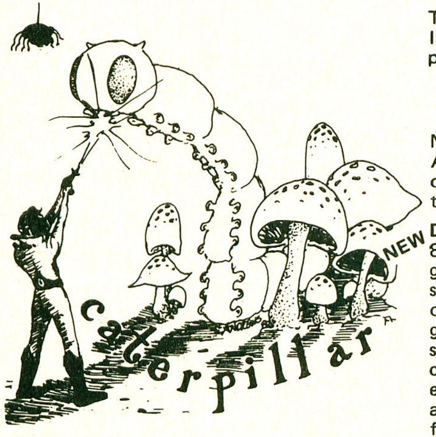
AARDVARK

TRS-80 COLOR COMMODORE 24 VIC-20 SINCLAIR/TIMEX TI99

QUEST – A NEW IDEA IN ADVENTURE GAMES! Different from all the others. Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time. 16k TI99, TRS-80 Color, and Sinclair, 13K VIC-20. $14.95 each.

32K TRS 80 COLOR Version $24.95.

Adds a second level with dungeons and more Questing.



CATERPILLAR

O.K., the Caterpillar does look a lot like a Centipede. We have spiders, falling fleas, monsters traipsing across the screen, poison mushrooms, and a lot of other familiar stuff. COLOR 80 requires 16k and Joysticks. This is Edson's best game to date. $19.95 for TRS 80 COLOR.

ADVENTURES

ADVENTURES!!!

The Adventures below are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer, commands like "Look in the Coffin" and "Light the torch.")

Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC. Now available for TI99. Any Commodore 64.

$14.95 Tape – $19.95 Disk.

ESCAPE FROM MARS

(by Rodger Olsen)

This ADVENTURE takes place on the RED PLANET. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)

This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

DERELICT

(by Rodger Olsen & Bob Anderson)

New winner in the toughest adventure from Aardvark sweepstakes. This one takes place on an alien ship that has been deserted for a thousand years – and is still dangerous!

Dungeons of Death – Just for the 16k TRS-80 COLOR, this is the first D&D type game good enough to qualify at Aardvark. This is serious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quest. Played on an onscreen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. At the normal price for an Adventure ($14.95 tape, $19.95 disk), this is a giveaway.

WIZARDS TOWER – This is very similar to Quest (see above). We added wizards, magic, dragons, and dungeons to come up with a Quest with a D&D flavor. It requires 16k extended color BASIC. $14.95 Tape, $19.95 Disk. VIC 20 Commodore 64.

NEW

PLANET RAIDERS – Not just another defenders copy, this is an original program good in its own right. You pilot a one man ship across a planetary surface dogfighting with alien ships and blasting ground installations while you rescue stranded troopers. Rescue all the troopers and be transported to another harder, faster battle. Joysticks required. ALL MACHINE CODE! EDSONS BEST! 16K Tape TRS80COLOR $19.95 – 32K Disk $21.95.

BASIC THAT ZOOOMMS!!
AT LAST AN AFFORDABLE COMPILER!

The compiler allows you to write your programs in easy BASIC and then automatically generates a machine code equivalent that runs 50 to 150 times faster.

It does have some limitations. It takes at least 8k of RAM to run the compiler and it does only support a subset of BASIC—about 20 commands including FOR, NEXT, END, GOSUB, GOTO, IF, THEN, RETURN, END, PRINT, STOP, USR (X), PEEK, POKE, *, /, +, -, >, <, =, VARIABLE NAMES A-Z, SUBSCRIPTED VARIABLES, and INTEGER NUMBERS FORM 0-64K.

TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20-page manual and can be modified or augmented by the user. $24.95 on tape or disk for OSI, TRS-80 Color, VIC 20, or Commodore 64.

SEAWOLFE – ALL MACHINE CODE In this high speed arcade game, you lay out patterns of torpedoes ahead of the attacking PT boats. Requires Joysticks, at least 13k RAM, and fast reflexes. Lots of Color and Sound. A fun game. Tape or Disk for Vic20, Commodore 64, and TRS-80 Color.

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RAINBOW CERTIFICATION SEAL

upper left corner with two clothespins. Place it in position on your stand and you will be able to type without the annoyance of flipstand and you will be able to type without the annoyance of flipping pages. Experiment to get the best results for your personal set-up.

This will also work effectively on hard-covered books and magazines provided that they are not too bulky. When not in use, clip the clothespins to the desk lamp you have in back of your stand or in some convenient place. The clothespins make good conversation pieces when you have visitors to your work area.

A neat way to keep *the Rainbow* open to a desired page when you want to key in some listing, is to open the magazine to the desired page, loosely fold the facing page in back of the cardboard/wood backing and clip it in two places, with you know what, on the top edge with the backing in between. When finished with that side, it should be no problem to clip the other side, except that the loose fold will be on the oposite side.

If you are copying from slick paper that reflects light, and you use a desk lamp in back of your typing stand, you will find by moving the lamp around that the portion you are copying can be made reflection-free.

Finally, if your cassette gets much use, the "play" key may not remain depressed because it is worn. As a temporary remedy, when pressing the "play" key, wedge one of the tapered ends of a clothes-pin in back of the "play" key and it will keep it in position so that you will be able to play and/or record until you get it fixed.

There is a way to fix the "play" key without returning it to Radio Shack or buying a new cassette, if it is a CRT-80A. Mine has gone out a few times and since it is working fine, the rule is: don't fool with it! When it goes again, I plan to write up the remedy in detail and offer it as a hint in a future article. In the meantime, if you are having problems with the "play" key on your CRT-80A, drop me a line and I will be glad to give you the remedy.

Keep creating, and if you have some hint to share, let this article be your conduit.

Back Issue Availability

Back copies of many issues of *the RAINBOW* are still available.

All back issues sell for the single issue cover price—which is $2 for copies of Volume I, Numbers 1-8 (through February, 1982), $2.50 for Volume I, Numbers 9, 10 and 12 (through June except May, 1982) and $2.95 for those issues thereafter. In addition, there is a $3.50 charge *per order* for postage and handling if sent by United Parcel Service and $6 for orders sent U.S. Mail. UPS *will not* deliver to a post office box or to another country. This charge applies whether you want one back issue or all of them.

Most back issues are available on white paper in a reprint form. Issues out of print include May, July, August, September, October, November,and December, 1982 and January, February, 1983. VISA, MasterCard and American Express accepted. Kentucky residents please add 5 percent state sales tax.

Due to heavy demand, we suggest you order back issues you want now while supplies last.

In addition, copies of the cover *only* of the July, 1982, Anniversary Issue are available separately for $1 each, plus 50 cents shipping and handling. These are suitable for framing.

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For your 16K TRS-80 Extended Basic Color Computer

Using your cassette recorder's condenser microphone, the COLOR TALK TO ME software package can let you use your own voice as an alternate means of input for any of your BASIC programs. Over 200 words can be stored in 16K RAM. With a little practice, you can attain from 80% to over 90% accuracy for most applications.

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No joysticks are required for this 4 player game. Place your bets on the variable odds and then wait for the sound of post time...and...they're off.

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GATOR ZONE-

is the first video computer game that takes a "byte" out of the Preppy craze! You can finally get even with those pesty Ivy League snobs by blasting away at a host of Preppy Gators on their home planet of "Preptune". You have to be quick, or the gators will gobble up your shirts! This is comic arcade fun at its best. Includes high-resolution graphics, on-screen scoring, joystick action, and three levels of play.

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STAR SIEGE lets you and your friend (or enemy) pilot two high resolution space ships while trading laser blasts. The first to take ten hits loses, but watch out for that pesty alien saucer! He wants to see to it that you both get vaporized.

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Turn your Color Computer into a supertypewriter. Screen displays 50 characters by 23 lines in real upper and lowercase. User modifiable. Remove our character generator and use it in your own basic program. This is an easy to use word processor. The character generator alone is worth the price of the tape. Works with tape or disk.

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STARBASE ATTACK-

Why be a loser? Here's an arcade game you can play to win. In other space city defense games you play until you lose. *STARBASE ATTACK* is totally different. Your mission is to clear a path for the escape vehicles which will carry your people to safety. Not only that, but you must also maneuver your own escape before alien warheads or a wave of killer asteroids level your dome-covered cities. You control high energy laser blasts and expansion shields, but watch out! You might end up the one who doesn't escape.

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* List expenses by month
* List expenses by account (year or month)
* List expenses by payee (year or month)
* Sort checks by date
* List to screen or printer.

In addition, 32K version flags deductible checks, flags checks subject to sales tax and computes the sales tax you paid. 16K or 32K Cassette $15.95. 32K Disk $21.95.

Blackjaq!

This is as close as you can get to the real thing without losing your shirt. A full casino simulation with five players and dealer, up to six decks and lightning fast action. Play alone (the computer plays vacant hands by card-counting rules) or invite your friends. Blackjaq keeps track of everyone's winnings and losings, gives card counting pointers, and, at your option, prints out the results of every hand. Amazing value. 16K EXT. Tape $19.95. Disk $24.95.

Koko Math!

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Federal Hill Software
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Baltimore, Maryland 21230

Software Review . . .

LList-Rite A Handy Inexpensive Utility

You cannot tell a book by looking at the cover. The same evidently holds true for looking at software's document. When I looked at the documentation for *LLIST-RITE* I did not see anything spectacular that the program was going to do for me (this is not saying the documentation is inadequate—I will cover that later), I was in for a pleasant surprise.

First and foremost, you need CoCo, a printer, and a cassette. *LLIST-RITE* comes on a cassette and runs in 16K or 32K Extended BASIC. It can be used to *LLIST* and length BASIC program that is *CSAVED* in ASCII format. The ASCII version can be simply gotten by *CSAVE* "program name," A. It observes page boundaries, e.g., gives you eight character wide left/right margins and margins at the top and bottom of each page.

LLIST-RITE prints in two columns which saves paper for its type of listing. It sets the line numbers apart from the text of the program where they can be easily found, breaks down miltiple statements, and lists *IF - THEN - ELSE* on separate lines so they logically make sense. It also gives you a screen display of the line it is currently working on, so you know where the program is at all times.

LLIST-RITE has only 4,367 characters and therefore *CLOADS* quickly. It is written totally in Extended BASIC and has plenty of *REM*'s to help you understand how it works and modify it if you desire. I modify most programs I buy to make them customized for *my* use so this was especially handy for me.

LLIST-RITE has a short but adequate documentation which states (in part) "If dissatisfied with *LIST-RITE* return package for a full refund." I would like to see this added to the documentation of all the software for CoCo. I'm quite a dreamer!

I cloaded *LLIST-RITE* in my 32K CoCo, picked out a program that I had previously *CSAVED* in ASCII, and began to get a listing on my Line Printer VIII, Beautiful!

LLIST-RITE lists your program in two columns, gives adequate margins for storing in a three-ring binder, and makes the listing highly legible. Since a picture is worth a thousand words. . .

Here is a sample *LLIST* of a program using CoCo's ROM!

```
520 LN=25-J:Q=2:GOSUB 770:IFLEN(
I$)>2THEN GOSUB 810:LN=LEN(I$):J
=-1:L$(I)=L$(I)+"  ":GOTO 500 EL
SE N=0:I$="":GOTO700
```

Here is the exact same line the way *LLIST-RITE* says it!

```
520 ' LN=25-J
521 ' :Q=2
522 ' GOSUB 770
523 ' :IF LEN(I$)>2
524 ' THEN GOSUB 810
525 ' :LN=LEN(I$)
526 ' :J=-1
527 ' :L$(I)=L$(I)+"   "
528 ' :GOTO 500
529 ' ELSE LN=0
530 ' :I$=""
531 ' :GOTO 700
```

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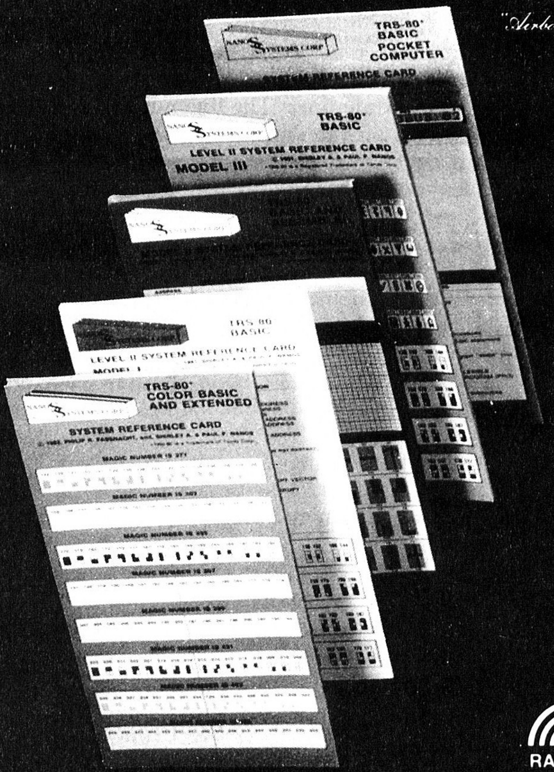
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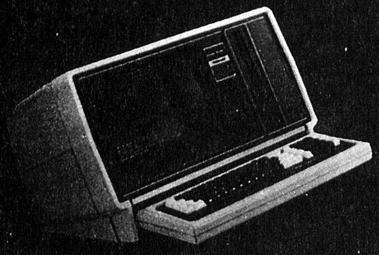

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Definitely impressive, huh? Notice how missing spaces are inserted so the commands are more legible. *IF, THEN,* and *ELSE* are put on separate lines. The line number is set off from the rest of the statement. I am an instructor/supervisor for computer maintenance people and most of my programming endeavors involve word processing. To more efficiently use memory, I use a "shrink" program that removes all spaces and, for speed, I use multiple program statements whenever I can. This insertion of spaces and separation of multiple statements certainly complements my reading after the writing his "cooled," *LLIST-RITE* numbers and prints a very meaningful heading at the top of each page. This is extremely useful in "getting your act together" if you save and refer back to listings from time to time.

It certainly makes your listings more legible, storable, and your "bugs" easier to find. The program is written in Extended BASIC so you can make changes, if necessary. It is internally documented with ample *REM*'s which helps you to understand how it does its thing. *LLIST-RITE* is very user-friendly. I believe anyone could use it.

A disadvantage is that it's slow! It took me just over 26 minutes to *LLIST LLIST-RITE* which contains 4,367 memory locations and it used more paper than CoCo's *LLIST* would use.

The documentation is good. It is short (one page) but contains the information neded to be off and running with superlative *LLISTS.* I noticed a couple of typographical errors but nothing worth noting.

I would like to see *LLIST-RITE* revised to enable the user to *LLIST* a segment of a program. The way it is now, it is either list all or nothing. I found one "bug" which resulted in a FC ERROR in 500 when the program was listing a line where I had a *REM* with no statement following it (this, by the way, is a very unusual programming tactic). I notified CoCo-Data and suggested a fix. They immediately wrote back and said they were able to duplicate the problem, tested my solution, and it was universal. They also changed the master tape so future programs sold will be "bug-free."

Should you buy it? This is where you must consider the sacrifice of time versus the gain in readability and bug-finding. Will there be an overall time savings? Just remember, they guarantee satisfaction or your money back—even the shipping and handling charge is refunded. Not many software retailers have that much pride in authorship. I really appreciated the timeliness of the response I got when I wrote them. In their letter to me, they said they offer pre-purchase information sheets (as opposed to selling the manual) for the asking. *LLIST-RITE*'s information sheet has a partial sheet of a listed program (using *LLIST-RITE*) and a general overview of the instructions. As you can see in the parenthetical data, the price is a small one to pay for an item that will make your computing a happier experience. Whatever your decision, I sincerely hope this review helps you make an educated one.

(CoCoDATA Enterprises, 1215 Emeralda Drive, Orlando, FL 32808, $5.95)

—Herbert B. Ridge

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Hardware Review . . .

Spectrum Switcher Gives You Fine ROM Pack Flexibility

The *Spectrum Switcher* is, by far, the easiest-to-use device we have yet encountered to keep two ROM Packs or cartridges "on line" at the same time.

Now, before you get the idea that you can keep two cartridge programs in memory simultaneously, let us say that such isn't possible to do—at least as far as we know. In other words, do not expect to be able to "combine" two programs at once.

But, the big hassle, at least for us, has always been the need to plug the disk controller in and out, depending on whatever else we might be using. The *Spectrum Switcher* eliminates that problem for once and for all.

The *Switcher* is a flat, lightweight plastic case with a cable on one end that plugs into CoCo's expansion port. It also has two connectors—for two ROM Packs. In addition, there are two switches and two sets of LEDs. Everything is clearly and attractively labeled.

You plug one cartridge into one of the ports and another into the other. Then, just turn on CoCo and it will start up selecting the cartridge in slot B. A simple flick of the switch turns off whatever is in slot B and turns on the cartridge in slot A. Just in case you can't tell from the screen, there is an LED to indicate which slot has been selected.

The other switch determines whether you want the cartridge to auto-start. If you want to make backups of cartridges on disk for your own use, this eliminates the necessity of taping over the pins in the cartridge. For those of us who like to transfer carts to disk to make access quicker, this is a major boon.

We like the *Spectrum Switcher* because it is very easy to use, looks nice and, in some pretty extensive testing, worked without fault. It also has gold contacts, which help eliminate problems associated with poor connections. It also eliminates the problem of plugging and unplugging cartridges into CoCo itself—which does cause wear on the expansion port.

We found only one problem with the *Switcher*, although it was minor. That is it is possible to lose a BASIC program in memory if you press the reset button on CoCo or switch one of the switches. Given the ability to switch back and forth between ROM Packs (especially when you have a disk drive) and to disable the auto-start function, the *Spectrum Switcher* is a fantastic device you will want to add to your setup. If you have a disk drive and are faced with the problem of unplugging and plugging it in, the *Switcher* is almost a necessity.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, $99.95)

Hint . . .

Print Out Disk Directory

If you have a long disk directory and want to see all of it, or if you simply wish to have a hard-copy printout of your directory, one simple command will allow you to do this easily.

Just POKE 111,254:DIR and the entire disk directory will appear on your printer, even if it is too long to be fully displayed on the screen.

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Software Review . . .

The 8-Bit Bartender
A Versatile, 32K Mixologist

All of you beer drinkers can skip this review if you like, but maybe if you read it you will learn something, like how to mix a "Rusty Nail." *The 8-Bit Bartender* by Prickly-Pear Software will be the center of attraction at your next party. Written for 32K Extended BASIC the tape version is loaded with a *CLOADM* and *ENTER.* As in other popular software by the same company, an auto-run feature takes care of the rest and gives you something to look at in the meantime. The program is also available on disk.

After loading the program, you are greeted with a chorus of "How Dry I Am" while a bubbling cocktail glass provides the animation. With the *8-Bit Bartender,* drinks can be searched in three fields. You can ask for a drink by name, main liquor or category.

More than 100 various cocktails are in the directory. The different categories are color-coded as to the type of glass they use. If you ask for a drink not on the menu, the program will inform you "I don't serve that!!!" The authors claim that extensive research was conducted in cocktail lounges in major cities to compile the list of 100 different drinks.

Well, that was just too hard to believe, so I set out on my own fact-finding mission. You can actually get all of these drinks in any well equipped bar within a short jump from your home. But let me warn you, don't ask your neighborhood bartender for "Velvet Hammer" or a "Dirty Mother" or you may be drinking alone with your computer.

After your supply of booze is exhausted, if you can still read or hear, exiting the program will entone a line of "The Party's Over." I think this novel program will be the talk of your next party if you can find someone sober enough to type. Now, how about a "Glog," no, make it a "Silver Bullet," no . . .

(Prickly-Pear Software, 9822 E. Stella Road, Tuscon, AZ 85730, $19.95 on tape)

—Dan Downard

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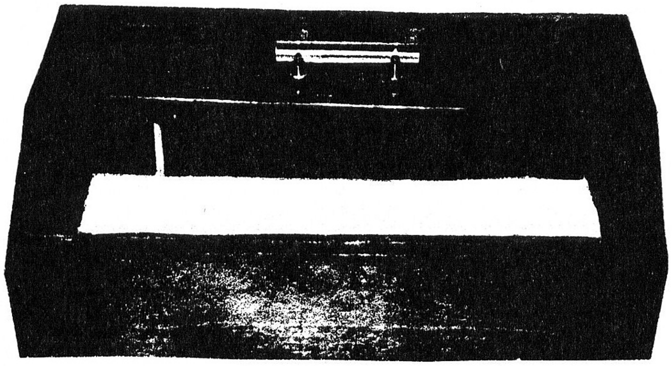

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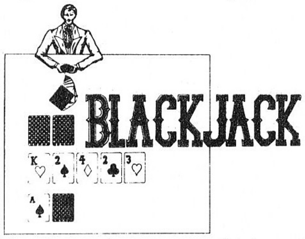

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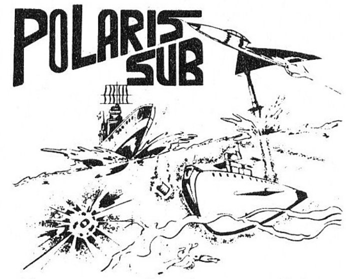

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BITS AND BYTES OF BASIC

Storing Files To Cassette Tape

By
Richard A. White
Rainbow Contributing Editor

The cassette interface is one of many CoCo features that sets it apart from other microcomputers. In fact, the cassette system is so bad in many other systems that disk drives are considered mandatory for any serious application, even in the home environment. Most serious CoCo owners now have only cassettes (as I write this). I expect defections from the ranks, myself included, since Radio Shack has taken a chunk out of the price of the Disk 0 drive. Still, cassettes will be a force and market for as long as I can see. I can then write a column on cassette operations only and know that I am addressing the needs of most *Rainbow* readers. File characteristics are so similar in cassette and disk operations that there is meat here for all.

There are three separate types of Color Computer files. First is the program file, BASIC or machine language. Next is the ASCII file which may contain numeric and string data or a non-tokenized BASIC Program. Third, there are special files like those generated by *Spectaculator* which can only be read by the program that made them. A pox on the house of authors who write these.

A BASIC or a machine language program file is nothing more than a sequential copy of a section of memory in the computer. They differ by code in the header that tells the computer which type is being loaded so it can handle the information properly. The locations of the beginning and end of a basic program are kept in menory. When a BASIC program is saved, all bytes between these two addresses are read to tape. When a BASIC program is reloaded, it starts filling memory at the beginning of BASIC then set and continues until all the program is in or until it runs out of memory when our friend, OM ERROR, appears. In Color BASIC, start of BASIC is 1537. In Extended BASIC it's 7680 at *PCLEAR4,* but can be changed by *PCLEARing* a different number. If you get an OM ERROR when loading a long program type *PCLEAR1* and try loading it again.

A machine language file carries its beginning address, end address and its execution address in its header and the computer copies the code into the defined stretch of memory. You can offset the file to a new location in memory by adding an offset value to the *CLOADM* statement like this: *CLOADM* "PROGNAME", 1000 where 1000 offsets the code up 1000 bytes. Whether the program will run offset is another matter. A pox on the house of authors who write non-relocatable code.

An ASCII file may be thought of as processed data rather than a direct memory dump. The data is found, processed in some way and copied into a buffer location. When the buffer is full, a header is written to tape and the whole buffer is copied to tape. The process continues, buffer by buffer, until all data is saved and the file is closed. A hand is up in the back of the room. What is an ASCII? ASCII refers to a standard numeric code representing characters and control codes. A carriage return is 13 while an A is 65. The whole list is in the back of your manuals. You can also ask the computer by typing ?ASC(A) and it will respond with a 65.

A BASIC program may be saved in ASCII format by the simple command *CSAVE*"PROGNAME",A. Why? How is this different from the regular save? When a line of BASIC is entered into the computer, some machine language code called the interperter looks for basic words like *PRINT, IF, INPUT* etc. When it finds a BASIC word, it looks up a number or pair of numbers for that word, called tokens, and puts the token in memory rather than the whole word. This saves memory and speeds program execution. When you make an ASVII save, the interperter untokenizes the BASIC line putting the BASIC words back in the line and puts the line into the buffer as a character string. In this form, the program can be read into a running BASIC program as data to be used in one way or another. Most terminal programs send and receive only ASCII files. The computer is smart enough to sort out whether the BASIC program being loaded is in ASCII or tokenized format. You will note that when loading an ASCII save of a BASIC program, the cassette stops and waits after loading each buffer while the interperter tokenizes each line and saves it to memory.

At the outset, I suspect you expected to learn about saving and loading data from a BASIC program. Now is the time. We already have laid some ground work and you know about the buffer and ASCII codes. When you *Open* a file, either out, "O," to the cassette or in, "I," from the cassette, you commit the buffer and start interaction with the cassette.

Statement	**Action**
OPEN "0",-1,"FILENAME"	The cassette is turned on and a header with file type and file name are sent to the recorder.
OPEN "I",-1"FILENAME"	The cassette is turned on a read looking for the header with file type and file name. If file names match, the first data buffer is loaded and the cassette is stopped.

Data is saved by putting it into the buffer with the *PRINT#-1,* I$ or *PRINT#-1,* I commands. Either strings or numbers may be sent in any order. I$ and I can be any variable names including script variables. Pieces of data are separated in the buffer by carriage returns. When the buffer is full, it is sent to tape; you did remember to leave the recorder on and in record mode, I hope. Data can be sent as it is generated or collected in memory and dumped all at one time. In a contest scoring program, I opened the entrants' file at the beginning, and the program saved a buffer every now and then as entries were typed in. This assured that if the program bombed, data entered to that point could be recovered. Data was also kept in memory and a complete second save was

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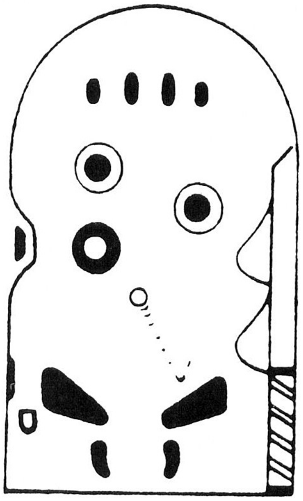

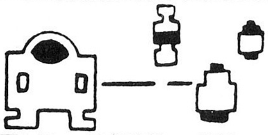

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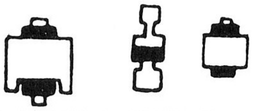

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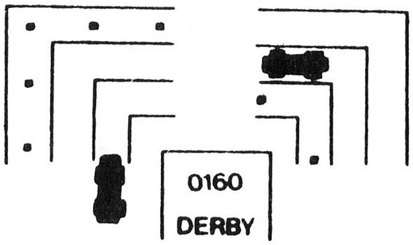

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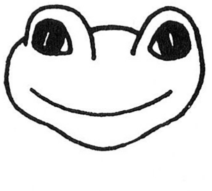

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made when entries closed. Care was necessary to assure that the second save contained exactly the same data in exactly the same order as the first.

The data loaded back into the cassette buffer from tape (or into a disk buffer) must be read into variables for storage. This is done with the *INPUT#-1,* or *LINE INPUT#-1,* statements (disk uses + numbers, i.e., *INPUT#*+1,) which takes data from the buffer and moves it to string or numerical storage as appropriate. When a buffer is emptied, the computer stops, reads in another buffer full anat is on tape is only a sequence of pieces of data. No variable names are saved. When you reload the data you must write your code so that data is *INPUT#-1,* or *LINE INPUT#-1,* into the proper variables, both by type and name. If you change your save routine to save another variable, or not save one if that be the case, you must make a corresponding change in your input code. Further, when you do this, previous files will be unloadable. You will need to make a special version of the cassette routines to read in old files and save them out in the new format.

Following are two of the simplest file saving routines and their corresponding loading routines:

```
  800 OPEN “0”,-1,“STRINGS” :FOR X = 1 TO
 PRINT#-1, A$(X)
:NEXT :CLOSE-1
  850 OPEN “I”,-1, “STRINGS” :X=1
  860 IF EOF THEN CLOSE-1 :GOTO 1000 ELSE
      LINE INPUT#-1, A$(X)
      :X=X+1 :GOTO860
  900 OPEN “O”,-1,“NUMBERS” :GOTO100
  910 PRINT#-1, A, B, X1, Y1, Z1 :RETURN
```

(The file is opened and control returned to the main routine to get the data. Each time a data set is ready to save the line 910 subroutine is called. When done a CLOSE-1 could be in the main program.

```
950 OPEN “I”,-1,“NUMBERS” :GOTO300
950 IF EOF THEN CLOSE-1 :GOTO1000 ELSE
    INPUT#-1, A, B, Z1, Y1, Z1 :RETURN
```

(The file is opened and control returned to the main program that calls 950 when it wants data. When end of file, EOF, is reached, the file is closed and control sent elsewhere.)

In the Strings code, there was an array of a known number of strings which was sequentially read to tape. When the file was loaded the strings were read with a counter X incremented after each input. *LINE INPUT* was used instead of *INPUT* in case there were any quotes, commas or colons in the data strings. *INPUT* has trouble with these. At end of file, EOF, the file is closed and control goes elsewhere. In the Numbers file, sets of non-subscripted numbers were saved until the main program was done and the file closed. The *PRINT#-1,* statement is shown as a subroutine, but it would probably be better in the main program. The file is read back in using an *INPUT#-1* to enter the same variables in exactly the order they were read to tape.

In the Numbers case there probably was no way of knowing how many file entries there would be. In the Strings case we did know and can use the following code:

```
800 OPEN “O”,-1,“STRINGS”:PRINT#-1,Y :FOR X=1
    TO Y :PRINT#-1, A$(X):NEXT:CLOSE-1:GOTO
    1000
850 OPEN “I”,-1,“STRINGS”:INPUT#-1,Y :FOR X=1
    TO Y :LINEINPUT#-1,A$(X) :NEXT :CLOSE-1
    :GOTO 100
```

Since we know how many records are on file and read that value in first, inputting can be in a simple *FOR-TO-NEXT* loop without a branch. Some like the top down aspect of this code better. Just because we have an end of file command, we don't have to use it.

In a complex program like a data management one, a number of variables and data arrays need to be saved in the file. It is imperative to tightly control the structure of the file and duplicate the structures in both output and input modes. Fortunately the input code is essentially a copy of the output code with *INPUT#-1* or *LINE INPUT#-1,* substituted for *PRINT#-1,. If you are writing in EDTASM+* or using a utility like Toolkit or Basic Aid, you can copy the output code and edit it to input lines easily.

Now for cleaning up the details. Always save the file twice! Tape is cheap and the time lost in regenerating a program or file will pay for hundreds of double saves. Cowards can save three times and win occasionally. Since many times we are starting a fresh tape, put in code to choose to run past the leader. I always put code in early in the development of a program to save it to tape.

```
10000 AUDIOON :INPUT“RUN PAST LEADER”:I$
  :IF I$=“Y” THEN MOTORON :FOR X=1 TO 6000
  :NEXT
10010 FOR C=1 TO 2 :CSAVE “PROGRAME”
  :MOTORON :FOR X=1 TO 600 :NEXT :NEXT
  :MOTOROFF
```

The advantage of this lies in the ease with which you save the program, which encourages more frequent saves when programming. All you do is set the recorder to record, type *GOTO* 10000 and answer Y or N and *ENTER* to the RUN PAST LEADER ? question. It is probably time for another trip to the kitchen anyway, so take a short break.

In the *OPEN* “I”,-1,“FILENAME” statement, the -1 is

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the device number. It tells the computer which buffer to use and where to send the buffer when full. If you had a disk, you would use a device number from +1 to +15. With the disk, you can have a number of disk buffers open at once along with a cassette file open. In this situation, files are closed by number and there seem to be some tricks on order of opening and closing. More on this after I have direct experience with a disk system. You can substitute a variable for the device number. This allows you to put code in to choose whether you want a sequential file to go to disk or to tape. The filename generally is a variable with code to allow the user to enter the file name to be saved and the name of the file to be loaded.

Cassette files are limited to sequential files where data is put to tape in sequence and must be accessed in the same sequence. Disks support sequential files, but can handle random files as well. For example, records can be saved individually to disk in random order and then individually retrieved in random order. In this way, large data bases are essentially on line with the program though little of the data is in memory at any one time. Typically, business programs require this type of storage to accomodate large data bases. I expect to see random access disk programs for CoCo as more users decide that their machine should be doing more for them than playing games.

Here is a good 'homework' problem you might want to tackle: Take one of your programs that saves a data file and convert it to have a run-past-leader option, and save twice. Note the *MOTORON* :FOR X=1 TO 600 :NEXT that leaves a little space between saves and at the end. If you haven't written a program using data files yet, wouldn't that be a neat next project?

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Hardware Review . . .

Panostyk Is A Boon To All You Frustrated Artists

I admit that I was somewhat skeptical of the *Panostyk* when it arrived the other day. It is unimposing-looking, with a sort of wooden board, an accordian-like bunch of metal rods and what appears to be a Radio Shack joystick tucked into a box on the bottom.

Looks can deceive.

What the *Panostyk* is happens to be a nice way to get pictures from paper to the graphic screen. Now, you can do this with Radio Shack's X-Pad, but the *Panostyk* is much less expensive.

The *Panostyk* comes complete with software, which—from a menu—allows you to use either a "sketch," "crayon" or "chalk" mode. The difference between them is primarily one of degree, but we felt that each offered a different type of drawing opportunity.

The "sketch" mode uses the high resolution graphics screen and is for drawing pictures in fine detail. Using a clear plastic circle with a small hole in it (suitable for inserting a thin pencil lead) you simply place a drawing under a plastic cover and then trace it. A good representation of what you have traced appears on the CoCo screen. Since "sketch" is in high resolution, you can get some nice drawings this way.

"Crayon" mode works in much the same way, except it uses the four-color mode to make colored lines. "Chalk" uses the low-res graphics, and all eight colors, which is very suitable for younger children, as well as those of us who do not draw too well.

The software includes an easy circle-drawing routine and color one is always an "eraser." In addition, you can "lift" the drawing pencil up from the "screen" by pressing a red button on the *Panostyk*. You can also "paint" in areas with a single button-press.

I suspect those of you who are adapt at art—such as Paul Hoffman, who has contributed some fabulous programs to *the Rainbow*—would much prefer the possibilities created by the X-Pad. But, for those of us who only look at what the likes of Paul do and wish, the *Panostyk* is an excellent way to try to transfer some of the things we see on paper onto the CoCo screen.

It is easy to use and comes with a well done software package which, for all intents and purposes, is invisible to the user. You just load the software, select the drawing mode you want, and concentrate on your artwork. And, for children, I believe that the "chalk" mode is an excellent way for them to have fun with the computer without frustrating them.

In addition to the *Panostyk* itself and the software, the package comes with several sample drawings, with markings for colors, circle points and the like. These are good to experiment with and are useful in getting the feel of the hardware.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, $79.95)

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On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

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64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

RAINBOW
CERTIFICATION
SEAL

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
> — The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

To order, send check or money order to:

Cognitec
704 Nob Street
Del Mar, CA 92014

Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

(Add $2 for shipping. Californians add 6% state tax. Allow 2 weeks for personal checks. Send self-addressed stamped envelope for Telewriter reviews from CCN, RAINBOW, 80-Micro, 80-U.S. Telewriter owners: send SASE or call for information on upgrading to Telewriter-64. Telewriter-compatible spelling checker (Spell 'n Fix) and Smart Terminal program (Colorcom/E) also available. Call or write for more information.)

Apple II is a trademark of Apple Computer, Inc.; Atari is a trademark of Atari, Inc.; TRS-80 is a trademark of Tandy Corp; MX-80 is a trademark of Epson America, Inc.

RAINBOW Info

What's A CoCo

CoCo is an affectionate name which was first given to the TRS-80 Color Computer by its many fans, users and owners. As such, it is almost a generic term for three computers, all of which are very much alike.

When we use the term CoCo, we refer to the TRS-80 Color Computer, the TDP System-100 Computer and the Dragon-32 Computer. It is easier than using the three "given" names throughout *the Rainbow*.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and TRS-80 Color are, for all purposes, the same computer in a different case, these terms are almost always interchangable.

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The Rainbow Seal

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product which carries the Seal has been physically seen by us and that it does, indeed, exist.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to *the Rainbow* for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal. This lets you know that we have seen the product and that it does, indeed, exist.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in *the Rainbow* and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

Using Machine Language

Machine Language programs are one of the features of *the Rainbow*. There are a number of ways to "get" these programs into memory so that you can operate them.

The easiest way is by using an Editor-Assembler, a program you can purchase from a number of sources.

An editor-assembler allows you to enter mnemonics into your CoCo and then have the editor-assembler assemble them into specific instructions that are understood by the 6809 chip that controls your computer.

When you use an editor-assembler, all you have to do, essentially, is copy the relevant instructions from *the Rainbow's* listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand assemble some programs.

Use the following program if you wish to hand assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00.

Changing Issue Dates

We will be "skipping" a cover date—but **not** issue of *the Rainbow* with the May issue this year.

You will still get 12 issues in each subscription. The change just means that you will get an issue "earlier" than it has been coming. This starts with the June issue—which will arrive at about the time that the May issue would normally arrive, or about a month early.

What this means is that next month's issue will be dated June. All subscription expiration dates will be changed to take this adjustment into consideration.

A full explaination is on page 79 of this month's issue.

The Rainbow Check

The small boxes which you see with programs in *the Rainbow* are our *RAINBOW CHECK* program, which is designed to help you type in programs accurately.

The check program itself is a machine language program which will count the number of characters you type in. You can then compare the number the *RAINBOW CHECK* gives you to those printed in *the Rainbow*. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use the *RAINBOW CHECK*, type in *CLEAR 25, 16303* (or *CLEAR 25, 32687 for 32K) and CSAVE* the program that follows. Then type in the command *EXEC* and press *ENTER*.

Now, whenever you press the down arrow, CoCo will give you the hexadecimal number of bytes in memory. This is to check against the numbers printed in *the Rainbow*. If your number is different, check the listing carefully to be sure you typed in the proper BASIC program code.

Type in programs *exactly* as you see them printed in *the Rainbow*. All BASIC listings are printed out 32 characters wide, conforming exactly to the CoCo screen display. Because the *RAINBOW CHECK* counts spaces, too, you should follow the spacing just as it appears in the magazine.

Here's the program:

```
 10 CLS:IF  PEEK(116)=127  THEN
X=32688 ELSE X=16304
 20 CLEAR 25,X-1
 30 IF PEEK(116)=127 THEN X=32688
ELSE X=16304
 40 FOR Z=X TO X+77
 50 READ Y:W=W+Y:PRINT Z,Y;W
 60 POKE Z,Y:NEXT
 70 IF W=5718 THEN 80 ELSE PRINT
"DATA ERROR":STOP
 80 EXEC X:END
 90 DATA 182, 1, 106, 167, 141, 0, 68
 100 DATA 134, 126, 183, 1, 106, 190
 110 DATA 1, 107, 175, 141, 0, 57, 48
 120 DATA 141, 0, 4, 191, 1, 107, 57
 130 DATA 129, 10, 38, 44, 52, 22, 220
 140 DATA 27, 147, 25, 142, 4, 0, 141
 150 DATA 6, 31, 152, 141, 2, 32, 25
 160 DATA 52, 2, 68, 68, 68, 68
 170 DATA 141, 4, 53, 2, 132
 180 DATA 15, 129, 9, 46, 4, 139, 112
 190 DATA 32, 2, 139, 55, 167, 128, 57
 200 52, 22, 126, 0, 0
```

"TRS-80 COLOR COMPUTER PRODUCTS"
"THE 1248-EP EPROM PROGRAMMER"

The 1248-EP EPROM PROGRAMMER is a full function unit that is compatible with virtually all popular 1K, 2K, 4K & 8K -by-8, 24 pin, 5 volt EPROMS. Compatible devices are 2508's, 2758 -0/1's, 2516's, 2716's, 2532's, 68732-0/1's, 68764's, and 68766's. Components 2732, 2732A, 2564, and 2764 are compatible via adapters (not supplied). The programmer is totally menu driven by resident position independent firmware in EPROM, which makes it suitable for experienced computer operators and novices alike.

Select the device type to be programmed from the device menu. Next, select the function to be performed from the function menu. On your command the 1248-EP will verify EPROM erasure, compare EPROM contents to specified contents of RAM or ROM, program blocks or individual bytes of EPROM memory or copy an EPROM's contents to user specified RAM.

The 1248-EP plugs into the cartridge slot of the Color Computer and is invoked by the user with the "EXEC & HC000" BASIC command. The 1248-EP contains its own on-board programming power supply, and has a quality "Zero Insertion Force" socket.

The combination of the TRS-80 Color Computer, an editor/assembler/monitor such as the Micro Works SDS80C⁑ and the 1248-EP EPROM programmer, makes a high performance, cost effective software development station for MC-6800/6809 microprocessor based systems. Use the system to store your own games or utility programs in EPROM's for execution from the cartridge slot using the CK4 PROM/RAM card described below.

The cost of the 1248-EP EPROM PROGRAMMER, instructions and adapter diagrams is just $99.95.

"THE CK4 PROM/ROM CARD"

The CK4 works with 2K, 4K or 8K-by-8 ROM's or EPROM's of the 5 volt only variety in 24 pin packages. In addition, the CK4 may be used with 4 static RAM's such as 6116's to expand the computers memory work space by 8192 bytes. Each of the four on-board sockets can be decoded to any 2K block of the memory map from $C000 through $F800 of the Color Computer. In addition, each socket can be configured to respond to address blocks from 2K to 8K bytes in length, thus accommodating 2K, 4K or 8K-by-8 ROM's, EPROM's or RAM's. ROM and RAM can be mixed on the card as well. RAM, on the card, can be written to and then "write protected" via dip switches on the CK4 to emulate ROM.

The instructions include information on how to set up the socket decoding circuitry and how to provide battery backup for programs stored in CMOS static RAM on the CK4 with the computer off or the cartridge removed.

The popular CK4 PROM/RAM card is now available in three versions.

1) The full featured CK4 remains the standard of cartridge board flexibility with the added capability of providing battery backup for CMOS static RAM's such as 6116's. Cost of the CK4 is still just $29.95.

2) The CK4-1 is a ROM only version of the CK4 card for use with CoCo's with later than "E series" circuit boards. These later versions of CoCo are not able to write to cartridge based RAM without modification. Cost is $27.95 for the CK4-1.

3) The CK4-2 is the unpopulated CK4 series circuit board only. Buy this version of the CK4 and configure them to meet your specific requirements at a price designed to stretch your dollars value. Cost is $15.95 each.

"MORSE ENCODER/DECODER KIT"

The MEDK80 Morse En/Decoder Kit consists of a machine code software driver on tape, a schematic diagram of the interface circuitry, component parts, a printed circuit board (PCB), packaging suggestions and complete instructions for building a Morse code transmission and reception system that is compatible with 4K RAM and up models of the TRS-80 Color Computer.

The transmitter/receiver interface circuitry is totally optically isolated and is, therefore, compatible with all receivers and transmitters. Transmitter and receiver both connect to the interface unit and to the Color Computer via the RS-232 port.

The MEDK80 Morse En/Decoder kit operates at speeds up to 70 words per minute and automatically adapts to speed variations of the sender. When transmitting, words are transmitted only when fully formed, i.e., followed by a space, and the transmit text buffer gives visual notification to the operator of what word/character is currently being sent. In addition, the text buffer is 512 characters deep, which is sufficiently large to keep up with the best of "rag-chewers".

Potential purchasers of this product should have previous kit building experience. However, this is not a kit of great complexity, and is well within the abilities of those actively involved in amateur radio or electronic hobbies to construct. To reduce the chance of wiring errors, component placement is indicated on the PCB and detailed assembly instructions are included.

The cost of the MEDK80 software, parts, and instructions is $39.95.

"COCO" GETS A BREADBOARD

The COCO BREADBOARD is a circuit board that plugs directly into the cartridge slot of the Color Computer and provides the user with 16 square inches of predrilled breadboarding area for circuit development, interfacing experiments, motherboard implementation, or whatever your imagination conjures up. The plated thru holes in the breadboard are wirewrap pin compatible and on 0.10 inch centers.

The COCO BREAD BOARD brings all of the data, address, and control signals available at the cartridge slot outside of the body of the computer and the signal lines are appropriately labeled to facilitate error free wiring of breadboards. A ground plane is provided on the top side of the board and solder pads are provided on the bottom of the board, thus facilitating circuit grounding and point-to-point wiring. In short, the COCO BREADBOARD was designed with the experimenter in mind.

The COCO BREADBOARD is attractively priced to justify its use for even the lowest budget projects. It is an ideal vehicle for learning interfacing techniques. Buy extras to have on hand for those rainy weekends.

The COCO BREADBOARD costs just $19.95. Price for two (2) or more is $16.95 each.

FACTORY FRESH COMPONENTS:

ITEM	DESCRIPTION	PRICE
2716 EPROM	2K by 8 Bit, 350 ns	$4.50 ea.
2532 EPROM	4K by 8 bit, 350 ns	$6.50 ea.
6821P	P.I.A.	$3.50 ea.
74LS156	Open collector decoder	$1.70 ea.
Socket	ZIF, 24 pin, Aries	$7.95 ea.

Minimum component order: $25.00

ORDERING INFORMATION:

Add $3.00 to all orders to cover shipping and handling. Allow two weeks for personal checks. Canadian residents add 5% to cover special handling. Arizona residents add 4% sales tax. Sorry! No charges accepted. All items shipped UPS.

Make checks payable to:

COMPUTER ACCESSORIES OF ARIZONA
5801 E. VOLTAIRE DRIVE
SCOTTSDALE, ARIZONA 85254
(602) 996-7569

⁎ TRS-80 is a trademark of TANDY CORP.
⁑ SDS80C is a trademark of the MICRO WORKS.
Prices subject to change without notice.

GAME

16K ECB

CoCo Says Repeat This Tune

By Larry Konecky
Director CAI In Music
Alcorn State University

Computer Assisted Instruction (CAI) is receiving much attention in all areas of education, particularly in subject areas where drill and practice exercises are necessary for student learning. In music education, ear training is an area in which much practice is necessary by many students for sufficient development to occur. Also, even though students may be in the same music theory classes, or at the same performing levels, their aural discrimination skills may vary greatly. For this reason programs which relate to various skill levels are necessary.

The following musical game is intended to give students practice in aural note identification at various skill levels. A piano keyboard is displayed on the screen upon which the computer plays sequences of notes which students must repeat by pressing the proper keys on the Color Computer. Since the computer keyboard is not like the piano keyboard some imagination is necessary to visualize the piano keyboard onto the Color Computer keyboard. A plastic overlay can be helpful by marking on the overlay the bottom row of keys ('Z', 'X', 'C', 'V', 'B', 'N', 'M', and ',') as piano white keys and in the next row ('S', 'D', 'G', 'H', and 'J') as black keys. Also relabeling the computer keys their respective piano key names (middle C through C above middle C) can be helpful.

At each novice level the computer shows which notes are being played as well as sounding them before asking students to repeat the sequence. In each other level only the first note is shown, forcing the player to rely on listening ability alone. The game begins with a one note sequence which is lengthened by one note after each successful completion of up to a maximum of fifty notes. This level can be changed by adjusting lines 10 and 755.

At the intermediate-diatonic level, the intervals between successive notes are limited to a maximum distance of a fifth. At the intermediate-chromatic level, the randomize function is set so that a greater amount of white key notes will occur than black key notes. In other levels the notes have an equal chance of being selected.

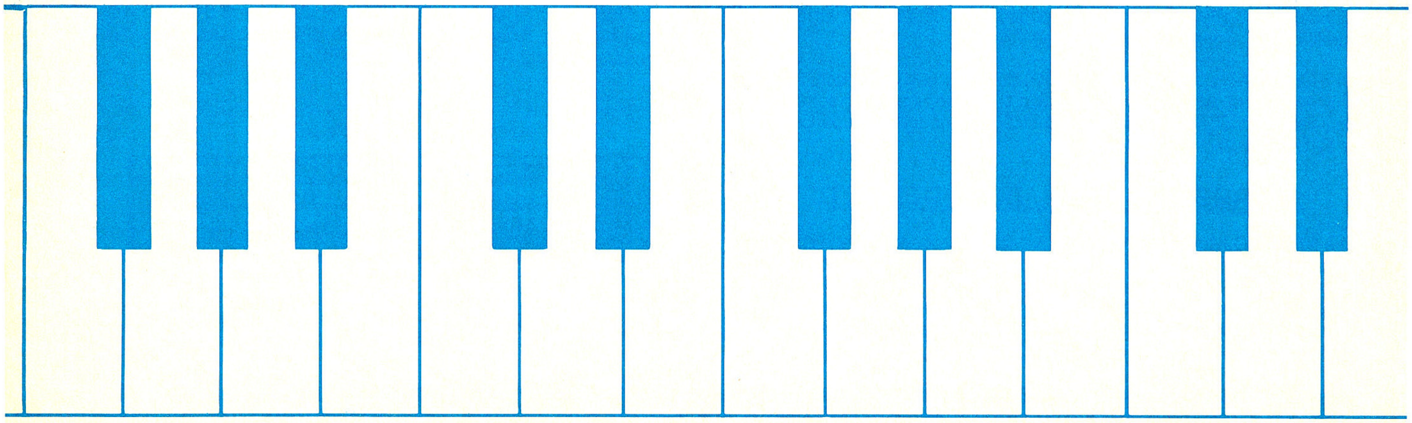
You may want to change the comments given at the end of each exercise or the levels at which they occur. Refer to program lines 1300 through 1460 to make the desired changes.

Statement 5 uses a *PCLEAR 1* which will give a syntax error the first time the program is *RUN* after it is loaded. Just retype *RUN*, press *ENTER* and the program will run without the syntax error.

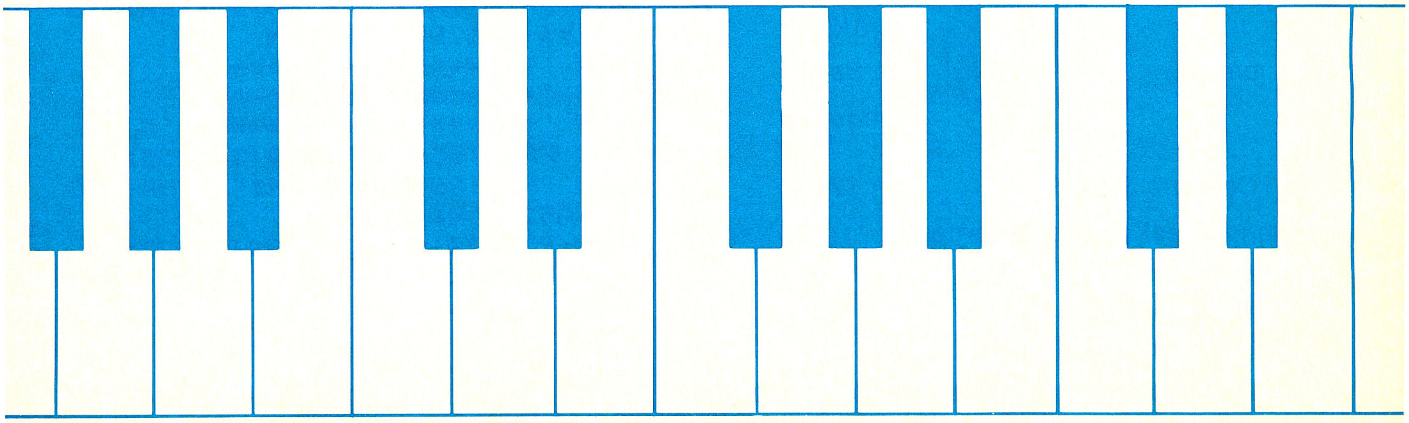
200	048F
680	098A
1210	0EF7
END	1398

The listing:

```
5 PCLEAR 1
10 DIM M(50),T(13)
14 '****************
15 '** note table **
16 '****************
20 FORB=1TO13:READT(B):NEXT
30 DATA 89,108,125,133,147,159,1
70,176
40 DATA 99,117,140,153,165
44 '***********************
45 '** keyboard graphics **
46 '***********************
50 W$=CHR$(207):WL$=CHR$(202):WR
$=CHR$(197):W2$=W$+W$:W3$=W$+W2$
:B$=CHR$(128):V$=CHR$(175)
60 C$=W2$+WL$+B$+WR$+W$+WL$+B$+W
R$+W2$:D$=W3$+V$+W3$+V$+W3$
70 F$=W2$+WL$+B$+WR$+W$+WL$+B$+W
```



```
R$+W$+WL$+B$+WR$+W2$:G$=W3$+V$+W
3$+V$+W3$+V$+W3$:H$=W2$+WL$
80 Y$=CHR$(159):R$=CHR$(255):GR$
=CHR$(223)
89 '***********************
90 '** introduction page **
91 '***********************
100 CLS0:PRINT@10,"*SIMON SAYS*"
;
110 PRINT@40,"*PLAY THIS TUNE*";
120 PRINT@96," A TUNE WILL BE DE
VELOPED ONE     NOTE AT A TIME. Y
OU ARE TO       CORRECTLY PLAY BA
CK THE TUNE     BY PRESSING THE C
ORRECT KEYS."
130 PRINT@256," YOU MUST ANSWER
QUICKLY!"
140 PRINT@326," ENTER YOUR NAME
: ";:PRINT@352,;:INPUTN$
150 PRINT@450," PRESS K FOR KEYB
OARD SETUP ";
160 PRINT@485," PRESS C TO CONTI
NUE ";
170 K$=INKEY$:M(1)=RND(13):IFK$=
""THEN170
180 IFK$="K"THENC=1:GOTO196
190 IFK$="C"THENC=0:GOTO200
195 GOTO170
196 GOSUB800
197 '******************
198 '** level select **
199 '******************
200 CLS4
210 PRINT@10,"*SIMON SAYS*";
220 PRINT@40,"*PLAY THIS TUNE*";
230 PRINT@96," SELECT FROM THE F
OLLOWING:";
240 PRINT@163," 1) NOVICE - - DI
ATONIC    ";
245 PRINT@195," 2) INTERMED - DI
ATONIC    ";
250 PRINT@227," 3) EXPERT - - DI
ATONIC    ";
255 PRINT@259," 4) NOVICE - - CH
ROMATIC   ";
260 PRINT@291," 5) INTERMED - CH
ROMATIC   ";
265 PRINT@323," 6) EXPERT - - CH
ROMATIC   ";
280 PRINT@122,;:INPUTR
290 IFR<1ORR>6THEN230
360 IFC=1THENC=0
370 GOSUB800
380 X=1
389 '**************************
390 '** computer note select **
391 '**************************
400 PRINT@38,STRING$(20,159);
410 PRINT@70,Y$+Y$+Y$+Y$"***LIST
EN***"Y$+Y$+Y$+Y$;
420 PRINT@102,STRING$(20,159);
430 IFR<4THENM(X)=RND(8)ELSEM(X)
=RND(13)
432 IFX>1ANDR=2THENGOSUB1500
433 IFX>1ANDR=5THENGOSUB1550
435 FORZ=1TO960:NEXT
440 FORY=1TOX
450 IFX=1ORR=1ORR=4THEN460ELSE47
0
460 GOSUB1000
470 SOUNDT(M(Y)),8
480 IFX=1ORR=1ORR=4THEN490ELSE49
5
490 GOSUB1050
495 NEXTY
497 '*******************
498 '** answer select **
499 '*******************
500 PRINT@38,STRING$(20,223);
510 PRINT@70,GR$+GR$;"***PLAY BA
CK!***"GR$+GR$;
520 PRINT@102,STRING$(20,223);
530 FORY=1TOX
540 T=1
```



```
550 K$=INKEY$:T=T+1:IFT>250THEN1
200
560 IFK$=""THEN550
570 IFK$="Z"THENK=1:GOTO700
580 IFK$="X"THENK=2:GOTO700
590 IFK$="C"THENK=3:GOTO700
600 IFK$="V"THENK=4:GOTO700
610 IFK$="B"THENK=5:GOTO700
620 IFK$="N"THENK=6:GOTO700
630 IFK$="M"THENK=7:GOTO700
640 IFK$=","THENK=8:GOTO700
650 IFK$="S"THENK=9:GOTO700
660 IFK$="D"THENK=10:GOTO700
670 IFK$="G"THENK=11:GOTO700
680 IFK$="H"THENK=12:GOTO700
690 IFK$="J"THENK=13
700 IFM(Y)=K THEN710ELSE1200
710 GOSUB1000
720 SOUNDT(K),7
730 GOSUB1050
740 NEXTY
750 X=X+1
755 IFX=51THEN1600
760 GOTO400
797 '***************************
798 '** print piano keyboard **
799 '***************************
800 CLS3
```

NEW from CoCoHut

THE ULTIMATE STRATEGY GAME

ZARCONIAN MARBLE

1 or 2 players

16K Ext. Basic required

Cassette $19.95 Disk $24.95

Send check or money order to:

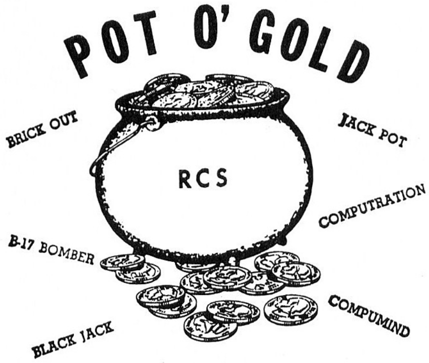
COCOHUT
P. O. Box 24451
Houston, TX 77015

RAINBOW CERTIFICATION SEAL

```
810 PRINT@10,"*SIMON SAYS*";
820 PRINT@40,"*PLAY THIS TUNE*";
840 FORX=1TO4:Y=X*32+129:Z=X*32+
257
850 PRINTY,C$;:PRINT@Y+12,F$;:P
RINT@Y+28,H$;
860 PRINT@Z,D$;:PRINT@Z+12,G$;:P
RINT@Z+28,W3$;:NEXT
870 IFC=1THENGOSUB900
880 RETURN
897 '***********************
898 '** computer keyboard **
899 '***********************
900 PRINT@100," COMPUTER KEYBOAR
D SETUP ";
910 PRINT@228,"S";:PRINT@232,"D"
;:PRINT@240,"G";:PRINT@244,"H";:
PRINT@248,"J";
920 PRINT@354,"Z";:PRINT@358,"X"
;:PRINT@362,"C";:PRINT@366,"V";:
PRINT@370,"B";:PRINT@374,"N";:PR
INT@378,"M";:PRINT@382,",";
930 PRINT@485," PRESS C TO CONTI
NUE ";
940 K$=INKEY$:IFK$=""THEN940
950 IFK$="C"THEN RETURNELSE940
989 '************************
990 '** notes being played **
991 '************************
1000 IF M(Y)>10THEN1040
1010 IF M(Y)>8THEN1030
1020 PRINT@M(Y)*4+318,R$;:PRINT@
M(Y)*4+350,R$;:RETURN
1030 PRINT@M(Y)*4+160,R$;:PRINT@
M(Y)*4+192,R$;:RETURN
1040 PRINT@M(Y)*4+164,R$;:PRINT@
M(Y)*4+196,R$;:RETURN
1047 '*********************
1048 '** return keyboard **
1049 '*********************
1050 IFM(Y)>10THEN1090
1060 IFM(Y)>8THEN1080
1070 PRINT@M(Y)*4+318,W$;:PRINT@
M(Y)*4+350,W$;:RETURN
1080 PRINT@M(Y)*4+160,B$;:PRINT@
M(Y)*4+192,B$;:RETURN
1090 PRINT@M(Y)*4+164,B$;:PRINT@
M(Y)*4+196,B$;:RETURN
1197 '*****************
1198 '** wrong answer **
1199 '*****************
1200 PRINT@36,STRING$(24,255);
1210 PRINT@68,R$+R$+R$"  THAT NO
TE WAS:  "R$+R$+R$;
1220 PRINT@100,STRING$(24,255);
1240 FORZ=1TO10
1250 GOSUB1000
1260 SOUND T(M(Y)),1
1270 GOSUB 1050
1280 SOUND T(M(Y)),1
```

RAINBOW CONNECTION SOFTWARE presents...

POT O' GOLD

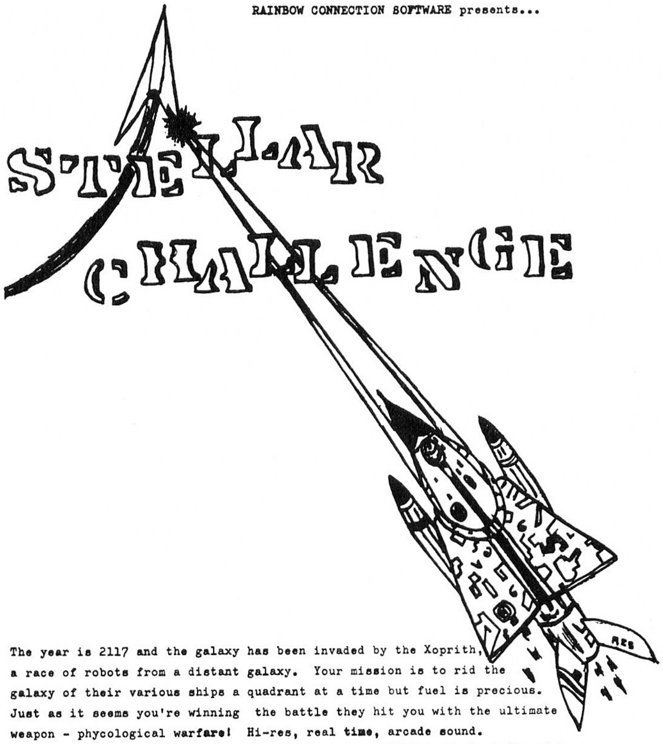


5 soundsational,colorful, graphic games for your Color Computer including: Brickout, B-17 Bomber, Blackjack, Jackpot and Computration - all for the price you might expect to pay for just one of these games!!!
Plus added bonus - Compumind: guess the computer's secret code from clues provided - a game of logic for the whole family. At this price can your library afford to be without them?

All machines - Ext. Basic NOT Required
$19.95 Cassette - $24.95 Disk

RAINBOW CONNECTION SOFTWARE presents...

STELLAR CHALLENGE



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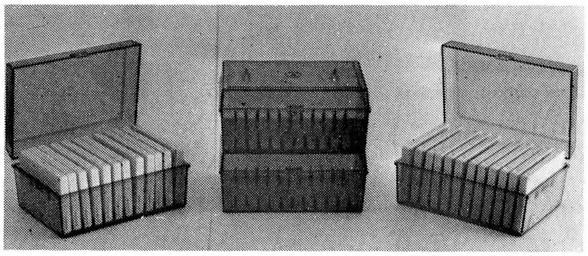

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```
1290 NEXT
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1297 '***********
1298 '** score **
1299 '***********
1300 IFX<6THEN1350
1310 IFX>5ANDX<11THEN1375
1315 IFX>10ANDX<16THEN1380
1317 IFX>15ANDX<21THEN1390
1320 IFX>20ANDX<26THEN1410
1330 IFX>25ANDX<31THEN1420
1340 IFX>30ANDX<41THEN1430
1345 IFX>40THEN1435
1350 PRINT@416," "N$", YOU DID P
OORLY!"
1360 PRINT@448," YOU ONLY MADE I
T TO "X-1
1370 GOTO1440
1375 PRINT@416," "N$", YOU CAN D
O BETTER.":GOTO1400
1380 PRINT@416," "N$",THAT WAS O
.K. ":GOTO1400
1390 PRINT@416," "N$",THAT WAS G
OOD!"
1400 PRINT@448," YOU MADE IT TO"
X-1:GOTO1440
1410 PRINT@416," "N$", THAT WAS
EXCELLENT!":GOTO1400
1420 PRINT@416," "N$", YOU ARE G
REAT!":GOTO1400
1430 PRINT@416," "N$", YOU ARE F
ANTASTIC!":GOTO1400
1435 PRINT@416," "N$", **UNBELIE
VABLE!!**":GOTO1400
1440 PRINT@485," PRESS P TO PLAY
 AGAIN ";
1450 K$=INKEY$:IFK$=""THEN1450
1460 IFK$="P"THEN200ELSE1450
1497 '************************
1498 '** intermed routines **
1499 '************************
1500 MX=M(X)-M(X-1)
1510 IFMX>4THENM(X)=M(X)-5
1520 IFMX<-4THENM(X)=M(X)+5
1530 RETURN
1550 MX=RND(3)
1560 IFMX=3THEN1580
1570 IFM(X)>8THENM(X)=M(X)-5
1580 RETURN
1597 '***************
1598 '** maximum # **
1599 '***************
1600 PRINT@416," "N$", *I GIVE U
P!!*"
1610 FORZ=1TO250STEP5:SOUNDZ,1:N
EXTZ
1620 FORZ=1TO10:SOUND240,1:SOUND
250,1:NEXTZ
1630 GOTO1400
```
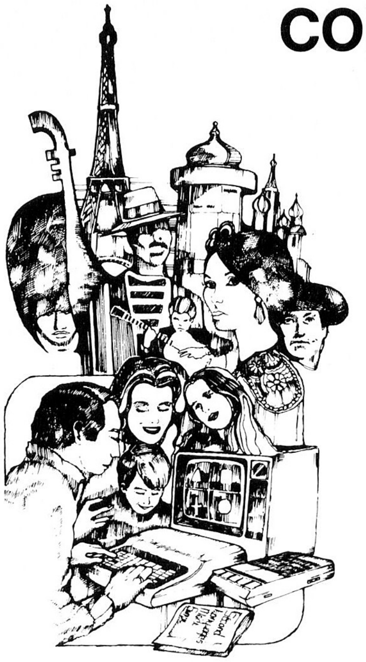

LEARN A SECOND LANGUAGE ON YOUR COLOR COMPUTER • NEW • EXCITING • EASY



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Skilled linguists have developed our series of second language programs. The lessons utilize the power of programmed instruction wherein you are advanced to new material only after satisfactory learning has occurred at the current level. Our techniques teach you how to think in a language without initially using any printed text material. No mental translation to your native language is required. You learn as a child does, hearing and speaking before reading. The computer both tutors and keeps track of progress as it moves you forward (or backward when review is necessary). AUDIO plus VISUALS plus INTERACTIVE RESPONSE establish the learning process, and literally THOUSANDS of visuals help seal-in the sound patterns of your new language.

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While the foregoing might seem complex, and it is, IT IS ALSO THE REASON OUR COURSEWARE CAN TEACH LANGUAGES. If you have tried 'game' or 'tape' language programs you know that they are ineffective. Our programs can teach you a language because we have successfully combined expert authoring of programmed courseware with **audio & visuals & response & branching** into a powerful tutorial package.

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EDUCATION

Education and The Color Computer

By Dr. Paul Kimmelman
***Rainbow* Education Editor**

To begin, thanks to all of you who have sent the names of your school district's computer coordinators. While the numbers have not been overwhelming, we have begun to establish an educational Color Computer network. It is interesting to see how many people are working with the Color Computer for educational purposes and more significantly, writing their own educational programs. In the future, we will describe some of the programs being used.

We are also becoming more enlightened through the number of telephone calls and letters we receive requesting more information about the Color Computer and its use in the schools. At this point, we are informing everyone who asks that our use of the Color Computers has indicated that they are durable and from a service perspective they have been very reliable. We are also finding that many companies are beginning to develop third-party software and peripheral equipment to use with them.

In the very near future a compact 3" micro-floppydisk drive system will be distributed for the Color Computer. Some of the features of this system will include a shirt-pocket sized disk instead of the traditional 5¼" disk that can store up to 1 Megabyte of information. The plastic cartridge has a flip-type head cover to protect it from dust, scratches and fingerprints. The system is a double-disk drive, and we should have more information on it by the next issue.

In addition, we are attempting to find monitors to use with the Color Computer. The significant advantage will be improved resolution for programs that require this type of clarity. There is a possibility that one of the problems of using the Color Computer with a monitor has been eliminated through the development of a cable that will enable Color Computer owners to use a true video monitor.

Now for the important part of using the Color Computer in our schools. If anything is becoming apparent, it is the fact that regardless of whether the Color Computer is being used in the home or in the school, the basis for its use should be designed to help young people learn more about how to control the computer. It is important that everyone realizes the basic categories that the computer can be used for with students.

First, many programs are designed to have the student respond to problems or questions displayed on the monitor. We believe that this type of instruction is important as long as it is used in conjunction with regular classroom instruction or as a supplemental activity.

More importantly, however, now is the time to begin establishing a basic curriculum for computer use and that curriculum must include working with programs such as *LOGO*. The young child who cannot read can very easily work with a parent or teacher and use the *LOGO* doodle mode to discover how he or she can make the turtle move around the screen. From there, as the child learns to read, there can be a gradual evolution of a more sophisticated curriculum whereby the child could be required to write his or her own programs. Children adapt to *LOGO* with ease.

We have heard from some individuals who are critical of *Color LOGO* because of several features that it does not include. It seems to me that we should focus on those aspects of the program that exist. The features that are not included will not affect *young* children's usage of *Color LOGO* to any significant extent.

LOGO is rapidly emerging as a popular children's language. The ROM pack that Radio Shack will produce will be more than adequate for young children who want to become familiar with this language. By the time they have mastered the components of *Color LOGO*, they will be ready to handle programming with other structured procedural languages.

We believe that we should encourage the use of the computers beginning with a child's kindergarten experience. Kindergarteners are capable of using joysticks with programs such as *Popcorn* and learn concepts such as directions—up, down, right and left. From that point the use of the doodle mode in *LOGO* and many other letter recognition programs will enable them to become comfortable and competent with the computer. Perhaps the most important aspect of computer education is that we develop fundamental skills and build upon them in a sequential manner.

The last component of the computer program—games—is one that is being debated by many educators and parents. I believe that games play a significant part in motivating students to work with computers. Like anything else, too much of any one activity could be counterproductive. However, student use of computers with programming languages, drill and test routines, and games can all be used interchangeably to develop a fundamentally sound computer literacy curricular program.

(Dr. Kimmelman is assistant superintendent of Norton City Schools, Norton City, Ohio.)

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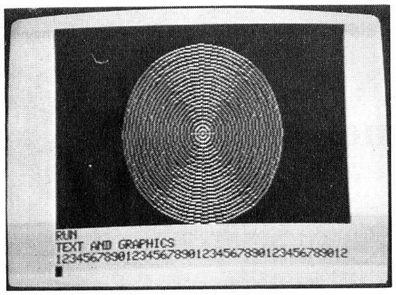
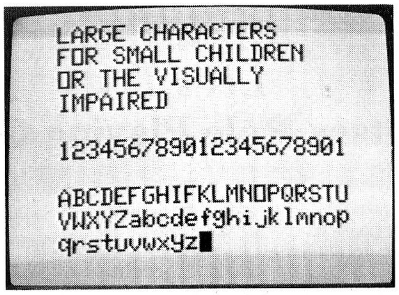


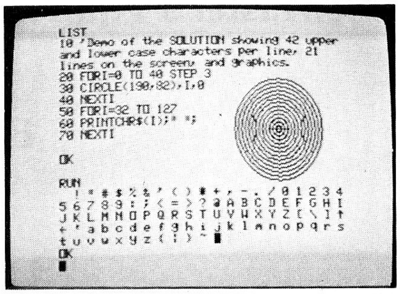
```
RUN
TEXT AND GRAPHICS
123456789012345678901234567890123456789012
```



```
LARGE CHARACTERS
FOR SMALL CHILDREN
OR THE VISUALLY
IMPAIRED

1234567890123456789O1

ABCDEFGHIFKLMNOPQRSTU
VWXYZabcdefghijklmnop
qrstuvwxyz█
```



```
LIST
10 'Demo of the SOLUTION showing 42 upper
and lower case characters per line, 21
lines on the screen, and graphics.
20 FORI=0 TO 40 STEP 3
30 CIRCLE(190,82),I,0
40 NEXTI
50 FORI=32 TO 127
60 PRINTCHR$(I);" ";
70 NEXTI

OK

RUN
  ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4
5 6 7 8 9 : ; < = > ? @ A B C D E F G H I
J K L M N O P Q R S T U V W X Y Z [ \ ] ↑
← ' a b c d e f g h i j k l m n o p q r s
t u v w x y z { | } ~ █
OK
█
```

SOLUTION ON CARTRIDGE

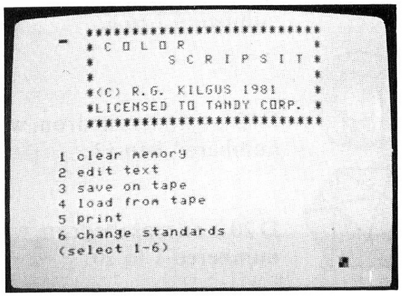
The cartridge version of **THE SOLUTION** has all of the features of the tape version and more. It works with all of the graphic modes (including 4 colors). It includes a 51 characters per line feature and the ability to define a text window on the screen. All of this and much more at the low price of — **$34.95**

ROM-PAKS **$9.95**

This is an empty Rom-Pak with a PC board. It will hold either a 2716, 2732 or a 2764. The case looks very similar to Radio Shack's Rom-Pak. Comes complete with instructions.

CUSTOM PROGRAMING

We will put your program in a Rom-Pak for you for a very reasonable fee. The program can be either Basic or machine language. Prices start at $19.95 for programs up to 4K in length. $29.95 for programs up to 8K. **Volume discounts** are available. Send for a **free submittal form.**



```
-   ***************************
    * C O L O R               *
    *         S C R I P S I T *
    *                         *
    *(C) R.G. KILGUS 1981     *
    *LICENSED TO TANDY CORP.  *
    ***************************

1 clear memory
2 edit text
3 save on tape
4 load from tape
5 print
6 change standards
(select 1-6)
```

SCRIPTFX $9.95

Are you tired of the upper case display of Color Scripsit? Well then **SCRIPTFX** is for you. This is a program which converts the display of Color Scripsit over to a real display of upper and lower case letters with descenders. The program allows all of the features of Scripsit to function and comes with a money back guarantee if it does not work. Please specify machine type when ordering. Extended Basic is not required.

SUPER PILOT $9.95

An enhanced version of Pilot for use with Extended Basic. Includes features for math, graphics, and sound. Has a feature that makes it easy to create flash card type drill programs. Programs are pseudo compiled for faster execution. Comes with as 24 page tutorial manual and demo programs. Sample program included on tape to get you started.

All programs for 16K, 32K Extended Basic machines unless otherwise noted. All programs on cassette. Add $4.00 per order for disk.

DISCOUNT — order **10** or more programs (you may mix types) and you will receive a 30% discount on the order. **Dealer** discounts are also available.

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919-828-6669

Phone COD orders accepted.

Congratulations

you made the right choice when you purchased a Color Computer. It is a very powerful machine.

However the standard display format does not do the machine justice. The machine is capable of much more than 16 lines of 32 all capital characters. Now you can give your Color Computer the display it deserves. **THE SOLUTION** gives the Color Computer a much better display than it normally has, and really makes the machine shine. Its features include:

- provides a screen of **42 characters** by **21** lines displayed
- linked directly to basic — program is transparent to the user
- prints all 96 ASCII characters, lowercase characters have descenders, has a slashed **zero** to avoid confusion when programing
- prints characters on any two-color graphic screen
- graphics and text may be intermixed on the same screen
- special mode with 4 lines of text at the bottom of the screen (just like some other famous color machines) — great for working with graphics
- large character mode for small children or the visually impaired
- character set may be reversed
- written in machine language, program is relocatable
- fast — prints at over 600 characters per second
- works with both cassette and disk
- includes a 20 page manual with demo programs (a lunar lander program is included)

SOLUTION **$19.95**

EXTENDER $ 7.95

Still want more than 42 characters per line from your computer. Then the **EXTENDER** is for you. This program when used with **THE SOLUTION** will give a display of **51** characters per line by 21 lines displayed. Please include your program serial number when ordering.

GRAPH LABEL $8.95

Have you ever wanted to place characters on a graphic screen but couldn't find an easy way to do it. Well then **GRAPH LABEL** is for you. This program will enable you to place characters anywhere on a graphic screen. It will place any of 96 ASCII characters on the screen or you may create your own characters. It features a cursor that may be moved anywhere around the screen with out rubbing out what it goes over. Superscripts and subscripts may be used since the cursor may be moved vertically and horizontally in steps as small as one pixel. Lowercase characters have descenders. **GRAPH LABEL** is written in Basic and is therefore easy to modify. It may be used by itself or as a subroutine.

SCREEN PRINT PACKAGE $8.95

A package of 2 programs for use with the LPVII, LPVIII, DMP100, DMP200, DMP400, DMP500. The programs will print an image of what is on a graphic screen to the printer. Both programs work with all the standard PMODEs. The programs are written in machine language and may be moved anywhere in memory. The two programs are:

1) **SCREEN PRINT** — will produce a regular size print. The image may be located anywhere on a page.

2) **DOUBLE SIZE SCREEN PRINT** — this program will produce a full size image that will fill up a sheet of paper. The finished product is 8 by 6.5 inches in size. Your computer graphics look really good when they are printed out with this program.

SHIPPING — add $2.00 for orders less than $20.00. Shipping is **free** on orders of more than $20.00.
Canadians — please send money orders only.
All orders shipped within 5 working days.

GameMaster's Apprentice

Let's Try
Fantasy Role Playing Games

By
George Firedrake
and
Bob Albrecht

Millions of young people, and many not-so-young, are playing fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), also called a referee, adventure master, or dungeon master (DM).

Most people who play role playing games use a formal rule system. Some of the best known are shown below.

Dungeons & Dragons (D&D). From TSR Hobbies, P.O. Box 756, Lake Geneva, WI 53147.

RuneQuest (RQ). From Chaosium, P.O. Box 6302, Albany, CA 94706.

Tunnels & Trolls (T&T). From Blade, Box 1467, Scottsdale, AZ 85252.

Worlds of Wonder (WOW). From Chaosium, P. O. Box 6302, Albany, CA 94706.

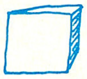
BEGINNERS BEWARE! The rulebooks are very difficult to understand. If you are a beginner, first try *Worlds of Wonder* or *Tunnels & Trolls*.

GameMaster's Dice

Most role playing game systems use dice to determine the outcomes of events. Dice are rolled to find out whether something happened or didn't happen. Did a character find the hidden treasure, or open the secret door, or hear the monster sneaking up behind her? Did the character solve the puzzle that unlocks the magic chest or read the cryptic runes? Who won the melee between the good guys and the bad guys? How much damage did our character take when he fell out of the tree? Roll dice to find out.

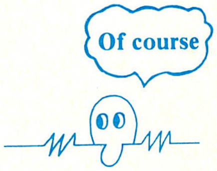
Dice are used to determine success or failure in using weapons. If a weapon attack is successful, dice are used to determine how much damage is inflicted. If a character can use magic, dice are rolled to determine if a spell is cast successfully and what its effects are. In playing a game, you spend much time rolling dice and interpreting the results of a roll. Fantasy role playing, like life itself, is part skill and part luck.

GameMaster's Dice come in many shapes, from tetrahedrons (4 sides) to icosahedrons (20 sides). We assume you are already acquainted with ordinary six-sided dice. We use the abbreviation D6 to mean one six-sided die.

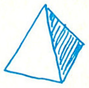


D6

D6 is one six-sided die
1D6 is one six-sided die
2D6 are two six-sided dice
3D6 are three six-sided dice
and so on.

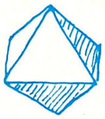


We also use less familiar dice, such as:



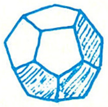
D4

D4 is a tetrahedron, with sides numbered 1 to 4. The number rolled is the one that is right side up after you throw the die.



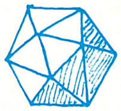
D8

D8 is an octahedron, with eight sides numbered 1 to 8.



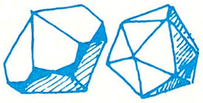
D12

D12 is a dodecahedron, with twelve sides numbered 1 to 12.



D20

D 20 is an icosahedron, with twenty sides numbered 1 to 20.



DIGIT DICE

A **digit die** (DD) can be a ten-sided die, with sides numbered 0 to 9, or an icosahedron with twenty sides numbered 0 to 9 (each number appears twice).

We use digit die (DD) to roll a **decimal digit**, 0 to 9. However, sometimes we want to roll D10, a number from 1 to 10. Easy—roll a DD and use 0 to mean 10.

REMEMBER: A **digit die** (DD) is a 10 or 20-sided die whose faces are numbered 0 to 9.

D100 is a **percentage** roll, also called a **percentile** roll, with numbers from 00 to 99. To make a percentage roll, use a DD (digit die), roll it twice. The first roll is the **ten's** digit; the second roll is the **one's** digit. If you roll a 3 the first time and a 7 the second time, the number is 37.

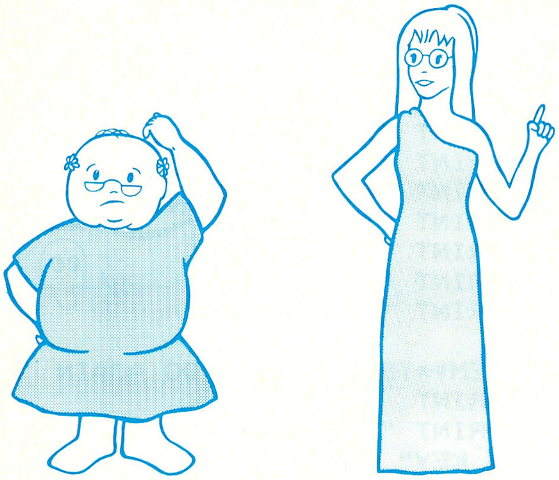
Or use two digit dice of different colors. One color (silver? gold? yellow?) is the ten's digit and the other (white? copper?) is the one's digit.

Sometimes, zero zero (00) is a **fumble**. If you roll a fumble ... alas ... your character may trip on his sword, drop the chest of gold on his foot, fall out of the tree in which he is hiding, or suffer another calamity gleefully prescribed by the GameMaster. (GameMasters love it, when *you* fumble.)

If you browse the literature of role playing games, you may encounter other dice abbreviations.

D3	Roll a D6 and read the results as follows: 1 or 2 is 1 3 or 4 is 2 5 or 6 is 3

The **possible values** for D3 are 1, 2, or 3.



D6+1	Roll a D6 and add one to the result. Possible values are 2 to 7 (2, 3, 4, 5, 6, or 7).
3D4	Roll three four-sided dice and add them. Possible values are 3 to 12. These values are not equally probable.
D6+D4	Roll one D6 and one D4, then add the results. Possible values are 2 to 10.

Another way to roll D3 is to roll D4. If you get 4, ignore it and roll again. If you don't have the proper dice, improvise!

Or, use your CoCo to roll dice. First, we challenge you to write a program to roll N dice, each with S sides. Yes, if you want, you can roll two-sided dice, or seven-sided dice, or 13-sided dice, or whatever imaginary dice *you* create. Hmmm ... if you do, think about what they might look like. Send us your designs for *fair* dice with 2, 7, 13, (and so on) sides.

Yup, we wrote a program to roll dice. Here is a RUN of our program.

```
DICE? 3D6
 12

DICE? 2D7
 6

DICE? DD
 4

DICE? P?
 73

DICE? D20 (Same as 1D20)
 16

DICE? and so on
```

We used DD to mean "Digit Die." We used P to mean "Percentile" roll.

Next time, we will show you our first GameMaster's Dice program. In the meantime, keep on rolling.

True Names, And Other Names

In role playing games, names are important. If you read fantasy, perhaps you know some of these names.

FRODO	GANDALF	ARAGORN	GIMLI
ELROND	CONAN	ELRIC	GED

If you acquire a character to play in a game, you usually get to choose the name of your character. You may choose any name, including your own name or the name of a friend. Any name is OK.

You might want to give your character a name different from the names you are used to, a name that "sounds like" the kind of person (human or otherwise) your character is. In a future article, we will talk about names that sound Gaelic, or Dwarvish, or Elfen, or whatever. This time, we will talk about *random* names that have a certain flavor.

When you see or hear:

ROKAR BARAK KUMAN MORAB

What do you think about them? What kind of characters might they be? How about:

MOSAS SOMAL RAMOS MIKOS

Without any additional information, pick three of the above as people to go adventuring with.

All of the above names have the form:

CONSONANT
VOWEL
CONSONANT
VOWEL
CONSONANT

We challenge you to write a program to create and display five-letter names consisting of: CONSONANT, VOWEL, CONSONANT, VOWEL, CONSONANT. We suggest your program should display several names, then say "FOR MORE NAMES, PRESS SPACE." If someone presses the space bar, you see one more line of names.

Think ahead. Anticipate what we might ask next. For example:

```
NAME STRUCTURE? CVCVC
HOW MANY NAMES? 20
```

CoCo prints 20 names

Consonant, Vowel Consonant, Vowel Consonant.

```
TO DO AGAIN, PRESS SPACE
```

So, we press the space bar and,

```
NAME STRUCTURE? VCCVC
HOW MANY NAMES? 16
```

CoCo prints 16 names

```
TO DO AGAIN, PRESS SPACE
```

With this program, you can try lots of name "flavors!"

Scan The Character File

Last time, we showed you a program to look up and display the seven basic characteristics for a *RuneQuest* or *Worlds of Wonder* character. Information on each character is stored, by name of characer, as a *record* in a *file* of records in DATA statements. You ask for a character by name and the CoCo displays the information for that character.

This time, a program to scan the entire file, beginning with the first record. To get the next record, you press any key. If the CoCo is already displaying the last record, you press any key. If the CoCo is already displaying the last record in the file (ENDFILE), pressing a key causes it to start over with the first record.

When you *RUN* the program, first you see:

```
NAME: ALOYSIOUS

STR          10
CON          11
SIZ          10
INT          12
POW          10
DEX          12
CHA          9

FOR NEXT RECORD, PRESS ANY KEY
```

So, press a key and see the second record in the file.

```
NAME: BAROSTAN

STR          17
CON          17
SIZ          13
INT          8
POW          7
DEX          15
CHA          6

FOR NEXT RECORD, PRESS ANY KEY
```

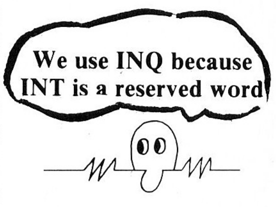
Keep pressing and eventually you will see the End-Of-File record. It looks like this:

```
NAME: ENDFILE

STR          0
CON          0
SIZ          0
INT          0
POW          0
DEX          0
CHA          0

FOR NEXT RECORD, PRESS ANY KEY
```

If you now press a key, the CoCo will start over with the first record (ALOYSIOUS).

Here is the program:

```
100 REM**SCAN CHARACTER FILE

300 REM**BEGINNING OF FILE
310 RESTORE

400 REM**READ A RECORD
410 READ NAME$
420 READ STR, CON, SIZ, INQ, POW
, DEX, CHA

500 REM**PRINT CHARACTER'S NAME
510 CLS
520 PRINT NAME$

600 REM**PRINT CHARACTERISTICS
610 PRINT
620 PRINT "STR", STR
630 PRINT "CON", CON
640 PRINT "SIZ", SIZ
650 PRINT "INT", INQ
660 PRINT "POW", POW
670 PRINT "DEX", DEX
680 PRINT "CHA", CHA

700 REM**TELL HOW TO DO AGAIN
710 PRINT
720 PRINT "FOR NEXT RECORD, PRES
S ANY KEY"
730 IF INKEY$ = "" THEN 730 ELSE
 810

800 REM**START OVER IF ENDFILE
810 IF NAME$="ENDFILE" THEN 310
ELSE 410

1000 REM**DATA FILE
1010 DATA ALOYSIOUS, 10, 11, 10,
     12, 10, 12, 9
1020 DATA BAROSTAN, 17, 17, 13,
     8, 7, 15, 6
1030 DATA BRIDLA, 11, 12, 10,
     15, 6, 11, 6
1040 DATA DERNFARA, 13, 13, 8,
     13, 4, 17, 6
1050 DATA JOLEEN, 13, 11, 7,
     13, 8, 17, 13
1060 DATA ROKANA, 9, 9, 9, 17,
     18, 9, 10
1070 DATA ENDFILE,0,0,0,0,0,0,0
```


We use INQ because INT is a reserved word

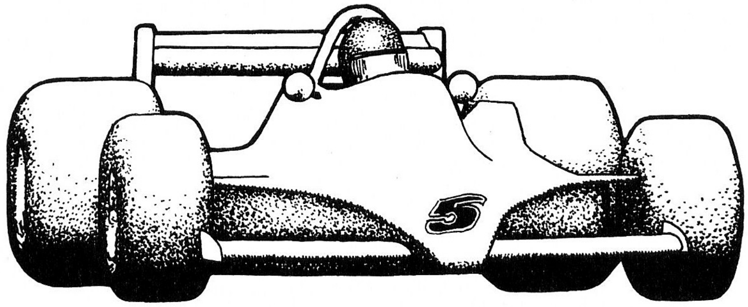
You can change the records in the DATA FILE to records for *your* characters, or add your character records to the DATA FILE. Remember to put ENDFILE in the *last* DATA statement.

Next time, we will combine two programs, CHARACTER FINDER and SCAN CHARACTER FILE, into a single program with a *menu* that lets you select which you want to do.

RND(RND(N))

Last time, Hieronymus Heuristicus wrote a program to compute a bunch of *RND(RND(2))* numbers and count how many ones and how many twos occurred. One of his

YOUR COLOR COMPUTER JUST GOT WHEELS!



REVOLUTION!

You accelerate hard down a long straightaway, braking heavily at the end for a hard corner. You slice smoothly through the esses, and then boldly keep the power on for a fast sweeper. The Ferrari drifts dangerously near the edge, but you make a tiny correction in the steering, and you are through.

The finish line flashes by, and suddenly you are in the pits. The car falls silent. You see your lap times being held up. Your final lap was a new lap record! At last, you permit yourself a small smile.

You have mastered this powerful car on a difficult track, driving with the assurance and precision that comes only from long hours of practice.

You are driving an *authentic* race car. You are playing *Revolution!*

FANTASTIC ACTION

Revolution uses high resolution, machine language graphics for action that is smooth and fast. The emphasis is on authenticity in the control and motion of your car. As in driving a real race car, accuracy and precision in your driving are what counts. Frills and non-essentials have been left out.

PURE COMPETITION

Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

A NEW CONCEPT

Revolution is a unique game, because it allows you to create the most important part of any race game: the track itself.

The first time you run *Revolution,* you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution,* this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY *REVOLUTION*

A prototype version of *Revolution* was published in the September, 1982 issue of Rainbow magazine, under the name *The Track.* The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution*'s fast, high-resolution machine language graphics are dramatically improved over the prototype's.

REVOLUTION NOW!

The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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RUNs looked like this:

```
HOW MANY RANDOM NUMBERS? 1000

POSSIBLE VALUE  NUMBER OF TIMES
 1                          758
 2                          242

TO DO AGAIN, PRESS ANY KEY
```

H.H. asked for a *sample* of 1000 *RND(RND(2))* numbers. He expected to get about the name number of ones and twos. Instead, he got about three times as many ones as twos.

Undaunted (and curious), he wrote a new program to gether information about *RND(RND(3))*, *RND(RND(4))*, and so on. Here is his program:

```
100 REM**RND(RND(N)) NUMBERS

200 REM** DIALOG WITH A PERSON
210 CLS
220 INPUT "FOR RND(RND(N)), WHAT
 IS N"; N
230 INPUT "HOW MANY NUMBERS"; S

300 REM**START COUNTS AT ZERO
310 FOR K=1 TO N
320 : C(K) = 0
330 NEXT K

400 REM**COUNT RANDOM NUMBERS
410 FOR K=1 TO S
420 : X = RND(RND(N))
430 : C(X) = C(X) + 1
440 NEXT K

500 REM**PRINT RESULTS
510 PRINT
520 PRINT "POSSIBLE VALUE", "NUM
BER OF TIMES"
530 FOR X=1 TO N
540 : PRINT X, C(X)
550 NEXT X

600 REM**TELL HOW TO DO AGAIN
610 PRINT
620 PRINT "TO DO AGAIN, PRESS AN
Y KEY";
630 IF INKEY$ = "" THEN 630
ELSE 210
```

Curious, H.H. typed *RUN*.

```
FOR RND(RUN(N)), WHAT IS N? 2
HOW MANY NUMBERS? 1000
```

He hasn't pressed *ENTER* yet.

To check out his program, H.H. first asks for a bunch of *RND(RND(2))* numbers. So he enters 2 as the value of N. In response to the computer's query about how many numbers, he asks for 1000 numbers.

Now, H.H presses the *ENTER* key. He waits patiently for the computer to do the work, and soon sees:

```
FOR RND(RND(N)), WHAT IS N? 2
HOW MANY NUMBERS? 1000

POSSIBLE VALUE  NUMBER OF TIMES

 1                          743
 2                          257

TO DO AGAIN, PRESS ANY KEY
```

Seems okay, so H.H. presses the space bar and asks for another sample, this time for N=3.

```
FOR RND(RND(N)), WHAT IS N? 3
HOW MANY NUMBERS? 1000

POSSIBLE VALUE  NUMBER OF TIMES
 1                          607
 2                          284
 3                          109

TO DO AGAIN, PRESS ANY KEY
```

H.H. then tried values of 4 and 5 for N. "Hmmm," thinks H.H., "I'm beginning to see a pattern here." So he tried 6 and 7.

"Aha! Eureka! I think I've got it!" exclaimed Hieronymus. "But why?" So, again, he called on his friend Annalee Analyticus to explain the *why* of the *what* his experimental investigations suggested to him.

Based on H.H.'s evidence, and more evidence that *you* obtain by running H.H.'s program, answer these questions:

- For *RND(RND(2))*, what is the probability of getting 1? , 2? .
- For *RND(RND(3))*, what is the probability of getting 1? , 2? , 3? .
- For *RND(RND(4))*, what is the probability of getting 1? , 2? , 3? , 4? .
- And so on. Mathophiles please generalize to *RND(RND(N)* where N is a positive integer. You will love the pattern.

Coming Attractions

Surely, but slowly, we will explore the following things:

- The Elusive RND
- GameMaster's Dice
- Looking up stuff in files. First, files of information in DATA statements and arrays. Next, cassette files. Eventually, disk files.
- Whatever else comes to mind or is suggested by you.

What do *you* want? If it fits into the general idea of "GameMaster's Apprentice," we might do it. Send your suggestions, complaints, kudos, requests, whatever ... to George & Bob, P.O. Box 310, Menlo Park, CA 94205.

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Software Review . . .

Whether Androids or Robots This One's A Fun Challenge

Android Attack (formerly *Robot Battle*) is a machine language, high resolution, arcade-type game from Spectral Associates. It pits you against a varying number of relentless, but at times not-too-bright killer androids, and . . . if you're fortunate enough to have 32K, the game will talk to you. I'm sure you're familiar with the genre. The player, in a protective suit, wanders from one set of rooms to another trying to destroy androids and gather treasure before the androids can destroy him. While doing this the player must avoid the electrified walls.

The game comes in two versions on a cassette, a 16K version and a 32K talking version. The 'talking' feature is a nice touch. The verbalizations are, as you would expect, mechanical in nature, but understandable. The mechanical aspect of the phrasing fits in nicely with the game's concept of man against machine. Both versions loaded easily into my 32K CoCo. The instructions state that the game will run on the CoCo, TDP, and Dragon Data. It requires 16K and joysticks. Extended Basic is not required.

The instructions set up an appropriate scenario and are clearly written. The game has 16 levels (0-15), and as the skill level increases, the androids pursuit, firing speed and accuracy increase accordingly. The names and scores of the top ten players for each load are displayed between each game. Spectral was also nice enough to include instructions for saving the game to disk.

As to the details of the game itself, you begin each game with four units of protection. You gain an additional unit of protection for each 10,000 points earned, up to a maximum of ten units. Each room is made up of a random series of walls with randomly placed exits, and a varying number of robots, all intent on shooting you.

Three sets of information are presented at the bottom of the screen: your accumulated score, a somewhat hard to understand bar of changing colors that show your remaining units of suit protection, and a timer that counts down to zero. The counter is reset for each room and if you have not exited the room before it reaches zero, you are automatically destroyed. Each time you exit a room it scrolls off the screen and a new and different one takes its place.

Player control is via the right joystick and is clearly explained in the instructions. You can direct fire and movement in eight different directions, and you also have the ability to jump and duck to avoid the androids fire. I found this added to the challenge of the game once you had mastered the steps involved. Each android you destroy turns into a mine that must be avoided. These mines, after a period of time, turn into ghost androids with the capabilities of pursuing you through the walls.

You get 50 points for each android you destroy, 100 points for each ghost android destroyed and 100 points for picking up the crown in each room. There is also a bonus feature. Once you clear a room of all androids and the crown, and have exited the room, you get a bonus of the time left on the countdown timer added to your score. After earning bonus points, the difficulty level of the ensuing rooms will increase and the androids will become smarter and faster. Your protective suit loses a unit of protection each time you come into contact with a wall, mine or android. You also lose a unit if you are hit by android fire.

I found the game quite enjoyable and challenging. Twelve-year-old Mike and seven-year-old Jamie, two veteran gamers, really got into this one. The graphics and animation are clear and smooth. The talking feature, while a little hard to understand at times, is adequate and adds to the enjoyment of the game. My only criticism is of the bar that shows how many units of protection you have left. While you can figure it out, it's hard to just glance at during the course of playing and get much information of a specific nature. Every other aspect of the game is top notch, and if you enjoy a game that will challenge your hand-eye coordination as well as require a little strategy to maximize your bonus scores then give *Android Attack* a try.

(Spectral Associates, 141 Harvard Ave., Tacoma, WA 98466, $21.95)

—Randall A. Smith

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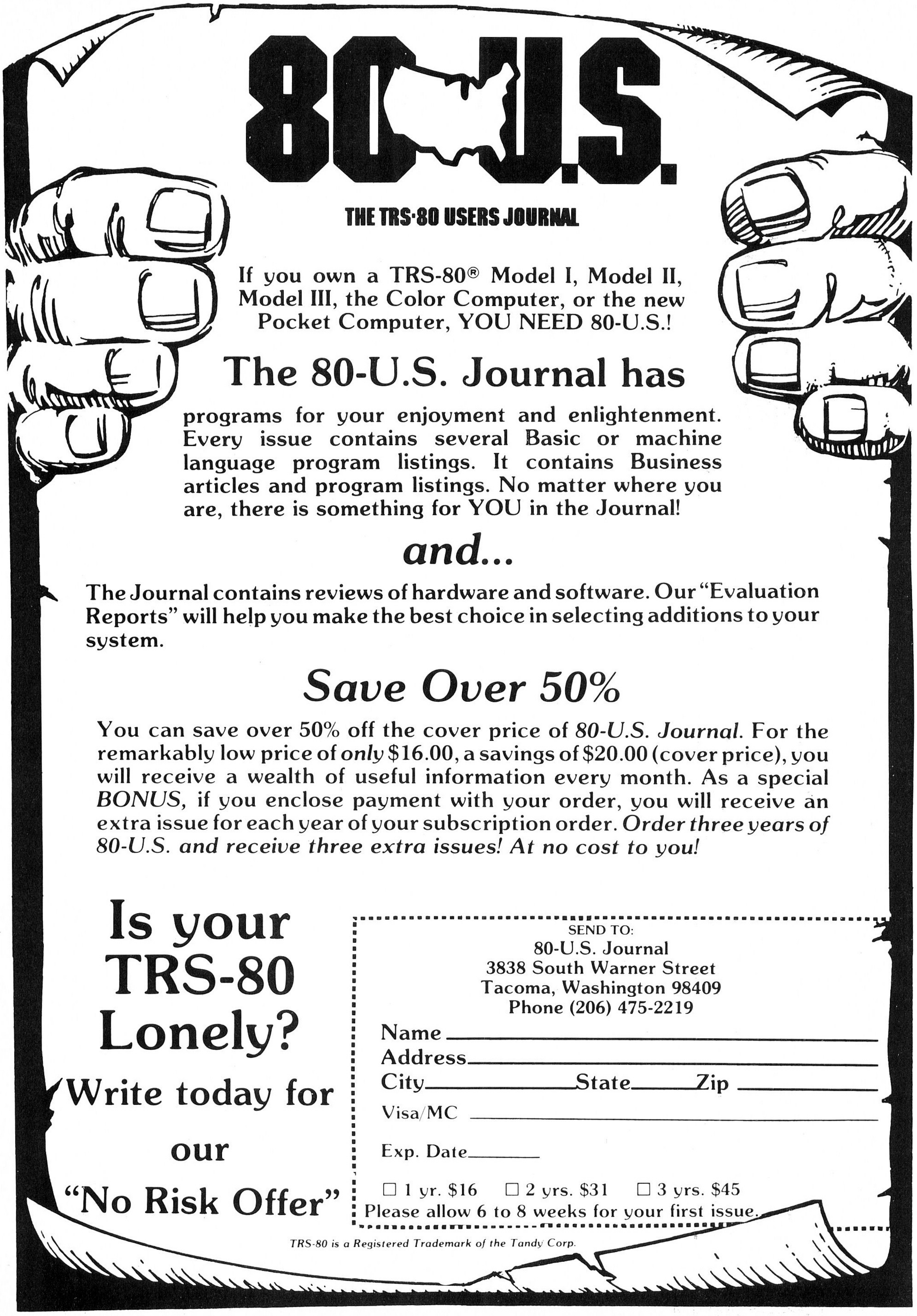

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16K ECB

Curvfitz Is Number Cruncher Of The First Order

By Mark Laessig

All of us Color Computer owners are hungry for new uses for our machines. The following article will show you how to do some useful and educational "number-crunching," for a little change from games and graphics. What I'll show you is called curve-fitting, which is a process where a computer can solve for a mathematical relationship that fits some measured data from an experiment with maximum possible accuracy.

Sound confusing? Let me give you a simple example dear to the hearts of us programmers. Let's say you've just written a new alphabetical sorting program for your Color Computer. How would you estimate how many names it would sort in a day's execution? Well, you could burn a whole lot of electricity, or you could do it much more easily. Instead you could time how long it takes to sort some name lists of convenient lengths, as in the make-believe data table below:

Names sorted	Time-seconds
20	2
50	6
100	13
150	22
200	31

Now from this data we should be able to make a prediction if we could use these numbers to make up some easily-calculated expression. The program I've given you at the end of this article, called *Curvfitz*, does just that. When you input your experimental data, like the five pairs of numbers above, *Curvfitz* will solve for the numbers c(0), c(1), and so on for the relation:

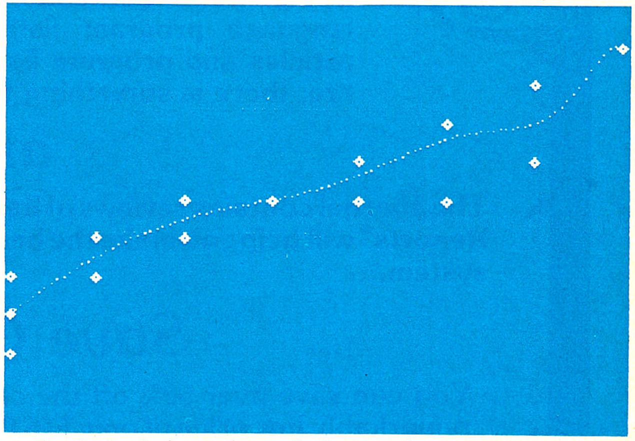
$$Y=c(0)+c(1)*X+c(2)*X^2+c(3)*X^3+...$$

where "Y" can be the number of names sorted and the "X" is the program's execution time in seconds. What do the trailing periods at the end of the equation mean? Well, you can solve for as many numbers c(0), c(1), and so on—called coefficients—as you like. For instance, if you only solve for the first two, you're trying to "fit" your data with a minimum of error to the relation

$$Y=c(0)+c(1)*X$$

which is the equation for a straight line. This is called a "first-order" curve fit. Had we decided to solve for three coefficients, this would be a second-order fit, and so on. Now, many things in nature are governed by "straight-line" relations, like the money you make compared to the hours you work, for instance. But many are more subtle than that, requiring the "higher-order" fits to match the data better. To see how good a match to your data a certain fit is, *Curvfitz* will both compare the fit to the data you input numerically, and will also plot a graph of both of them for you using PMODE4 graphics.

This will be clearer after we use *Curvfitz* to solve our sorting program example. Key in *Curvfitz*, type PCLEAR4, and then RUN. You have to PCLEAR4 first due to the DIM statements on lines 200-230. You're first asked for the number of data point pairs, which in our case is five. You're then asked for the order fit you want. Let's try a straight line for now, so type one. Notice that you have to have more data points than the order fit you want, but this usually isn't a problem. You're next asked to input your data, with the X and Y prompts having the same meaning as in the relation I gave earlier. Since we'd like to eventually solve for names sorted, let's have execution time be X and names sorted be Y. If you make a mistake in inputting your data, you can cycle through it again and simply change values. When you're ready, type "N" in response to the prompt for rechecking data and *Curvitz* will "crunch" for a bit and print out your coefficients. If you did everything right, you should get c(0)=12.784 and c(1)=6.163.



Once you've copied these numbers down someplace, hit enter and *Curvfitz* will show you how good a first-order straight line fit is by outputting a table of measured X and Y values along with the Y values the fit would predict at that point. For 13 seconds execution, the fit predicts 92.9 names sorted instead of 100, which might be accurate enough for you. At this point, *Curvfitz* will also plot on the screen the fitting curve and the measured data. The plot is automatically scaled to fit on the screen with the low X and Y values in the lower left-hand corner. In this way you can see graphically whether or not your fit is a good one.

So how many names would be sorted in a day? Since a day is 86,400 seconds, then

Names sorted = 12.784+6.163*(86400) = 532,500 names,

or the size of a medium phone book!

What about a second-order fit? Well, when you try it you'll find that it'll match the data better within the range of measurements you've taken, but outside that range things might be less accurate than before. Every time you increase the order of the fit, you're allowing more "wiggles" to appear in your fitting curve, which may have bad consequences. A second-order fit on our sorting problem, for instance, tries to fit a parabola your data instead of a straight line, and you get a negative number for the number of names sorted in an hour!

I hope you've found this little bit of number-crunching interesting. Curve-fitting to experimental data is an easy chore for any budding scientist when armed with his Color Computer. Good luck and have fun!

350	039E
750	06A8
950	08A8
END	0B2D

The listing:

```
10 'PROGRAM=CURVFITZ
20 '
30 '  MARK LAESSIG
40 '  2503 KINGSTON RD.
50 '  CLEVELAND HTS. OH 44118
60 '
70 '  PRODUCES COEFFICIENTS FOR
80 '  A BEST FIT TO EXPERIMENTAL
90 '  DATA POINTS. INCLUDES A
100 '  DISPLAY OF THE RESULTS.
110 '
120 '  REQUIRES EXTENDED BASIC
130 '
140 PRINT"TYPE <PCLEAR 4> BEFORE
 RUNNING.":PRINT"HAVE YOU DONE S
O<Y,N>";:INPUT Z$
150 IF Z$<>"Y" THEN STOP
160 PRINT"HOW MANY DATA POINT PA
IRS";:INPUT N
170 PRINT"WHAT ORDER FIT--"
180 PRINT" (LESS THAN NO. OF POI
NT PAIRS)  ";:INPUT M
190 IF N<=M THEN 170
200 DIM X(N),Y(N)
210 M1=M+1:M2=M+2
220 DIM S(2*M),S2(M1)
230 DIM C(M1,M2)
240 PRINT:PRINT"IF VALUE IS OK,
PRESS ENTER"
250 PRINT"OTHERWISE, INPUT VALUE
."
260 PRINT" ALL VALUES INITIALLY
ZERO."
270 PRINT:PRINT" PAIR NO.":PRINT
"**********"
280 FOR I=1 TO N
290 PRINT I;"   ==>   X:";X(I);:
INPUT XX
300 PRINT"            Y:";Y(I);:
INPUT YY
310 IF XX<>0 THEN X(I)=XX
320 IF YY<>0 THEN Y(I)=YY
```

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(The Enchanted Forest was reviewed in the Dec. 1982 issue of Rainbow).

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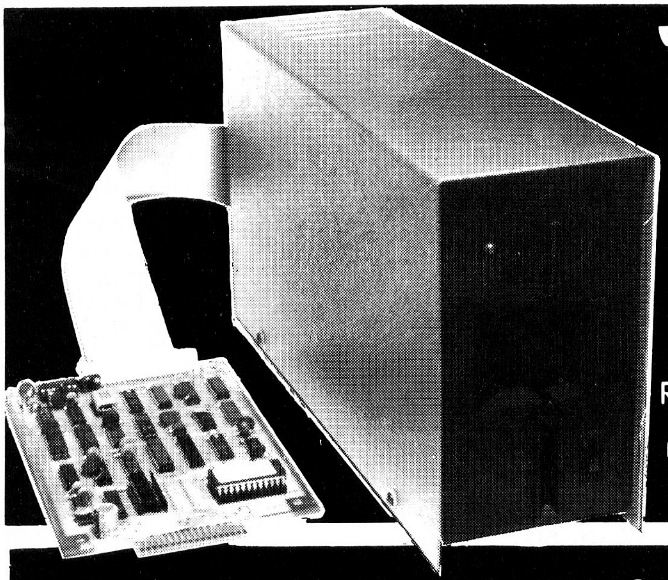
```
330 IF I=1 AND Q$<>"N" THEN XL=X
X:XH=XX:YL=YY:YH=YY
340 IF X(I)<XL THEN XL=X(I)
350 IF XH<X(I) THEN XH=X(I)
360 IF Y(I)<YL THEN YL=Y(I)
370 IF YH<Y(I) THEN YH=Y(I)
380 NEXT I
390 PRINT"RECHECK DATA<Y,N>";:IN
PUT Q$
400 IF Q$<>"N" THEN 280
410 '
420 PRINT:PRINT" ..WORKING..":PR
INT
430 'SOLUTION OF SIMULTANEOUS
440 'EQUATIONS TO GET BEST FIT
450 '
460 FOR I=0 TO 2*M
470 FOR J=1 TO N
480 FC=ABS(X(J)^I)
490 IF(I/2-INT(I/2))>.01 THEN 53
0
500 IF I>0 THEN S(I)=S(I)+FC
510 IF I<=M THEN S2(I+1)=S2(I+1)
+FC*Y(J)
520 GOTO 550
530 IF I>0 THEN S(I)=S(I)+SGN(X(
J))*FC
540 IF I<=M THEN S2(I+1)=S2(I+1)
+SGN(X(J))*FC*Y(J)
550 NEXT J,I
560 '
570 'SOLUTION BY GUASSIAN
580 'ELIMINATION
590 '
600 C(1,1)=N
610 FOR A=1 TO M1
620 FOR B=1 TO M1
630 IF A=1 AND B=1 THEN 650
640 C(A,B)=S(A+B-2)
650 NEXT B
660 C(A,M2)=S2(A)
670 NEXT A
680 FOR I=1 TO M1
690 FOR J=M2 TO I STEP -1
700 C(I,J)=C(I,J)/C(I,I)
710 NEXT J
720 FOR K=M2 TO I STEP -1
730 IF I=1 THEN 780
740 FOR L=1 TO I-1
750 C(L,K)=C(L,K)-C(L,I)*C(I,K)
760 NEXT L
770 IF I=M1 THEN 810
780 FOR L=I+1 TO M1
790 C(L,K)=C(L,K)-C(L,I)*C(I,K)
800 NEXT L
810 NEXT K
820 NEXT I
830 PRINT:PRINT" COEFICIENTS:"
840 PRINT"**************"
850 FOR I=1 TO M1
```



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```
860 PRINT "C(";I-1;") = ";C(I,M2
)
870 NEXT I
880 PRINT"HIT ENTER TO GO ON.":I
NPUT Q$
890 PRINT:PRINT"  ** ACCURACY OF
 FIT **":PRINT
900 PRINT" PAIR   X       Y
CALC. Y"
910 PRINT"  ********************
********"
920 FOR I=1 TO N
930 IN=X(I):GOSUB 1130
940 IF X(I)>999 OR Y(I)>999 THEN
 PRINT USING " ## #.##^^^^ #.##^
^^^  #.##^^^^";I,X(I),Y(I),YC EL
SE PRINT USING" ## ###.### ###.#
## ###.###";I,X(I),Y(I),YC
950 NEXT I
960 PRINT:PRINT"DO YOU WANT A PL
OT";:INPUT Q$
970 IF Q$<>"Y" THEN END
980 PRINT" THE DATA POINTS ARE C
IRCLES"
990 PRINT" AND THE PREDICTED CUR
VE IS "
1000 PRINT" THE SMALL DOTS. READ
Y";:INPUT Q$
1010 PMODE 4,1:PCLS:SCREEN 1,0
1020 FOR I=1 TO N
1030 IN=X(I):YC=Y(I):FL=1:GOSUB
1220
1040 NEXT I
1050 ST=(XH-XL)/100
1060 FOR IN=XL TO XH STEP ST
1070 GOSUB 1130
1080 FL=0:GOSUB 1220
1090 NEXT IN
1100 FOR I=1 TO 3000:NEXT I:END
1110 '
1120 'CALC. FIT ROUTINE
1130 YC=0:FOR J=0 TO M
1140 FC=ABS(IN^J)
1150 IF(J/2-INT(J/2))>.01 THEN 1
180
1160 YC=YC+FC*C(J+1,M2)
1170 GOTO 1190
1180 YC=YC+SGN(IN)*FC*C(J+1,M2)
1190 NEXT J
1200 RETURN
1210 'PLOT OUTPUT ROUTINE
1220 XP=250*((IN-XL)/(XH-XL))+2
1230 YP=140*(1-(YC-YL)/(YH-YL))+
20
1240 IF FL=1 THEN CIRCLE(XP,YP),
2 ELSE PSET(XP,YP,1)
1250 RETURN
```

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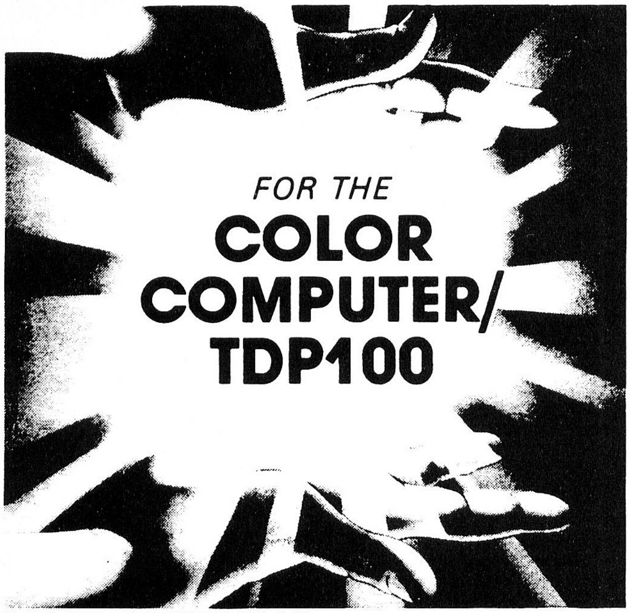

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COLOR GRAPHICS EDITOR

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AT LAST, a graphics drawing program that is USEFUL in writing programs that use graphics.

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Software Review . . .

Arcade-Style *Gazon* Is Vidiots Delight

Being a video game junkie, or *vidiot*, I love to play fast arcade-like games on my CoCo. *Gazon* is a fun game that is bound to become a favorite of the arcade game players.

Gazon is a machine language program that requires 16K Extended BASIC. It comes with a short instruction sheet that tells you how to load and execute the program, start the game, and how to play another game.

After executing the program, simple playing instructions start to scroll up the screen in high resolution characters. You can select from three levels of play, Easy, Medium, and Hard. You use the right joystick to fire and move your ship, which looks like a flying saucer.

It's best to start on the Easy level to get the feel of the game. On Medium, Gazonians get smarter and start avoiding you. On the Hard level you also fire slower, which makes things more interesting.

The object of *Gazon* is to protect your 13 supply pods in the center, for as long as you can, while the Gazonians try to steal them. The man-like aliens die when you shoot them, but the only way to kill the oval-shaped ones is to run them over.

When you kill a Gazonian carrying a pod, the pod is deposited in the last space occupied by it. The pods cannot be destroyed and the Gazonians always seem to find them. The man-like aliens start out worth 10 points, but after about a minute of play, this increases to 20, then 30, and so on. The oval-shaped aliens are always worth 100 points.

My only criticism of *Gazon* is that you can only fire in eight direcitons and you cannot move and fire at the same time, but this seems to be true of most arcade-like games.

A couple of interesting features are also included. After a certain number of replays, the colors of everything change, including the instruction screen. It also keeps track of the high score for each of the three levels of play. Most of the other arcade-like games I have played only keep track of one high score.

All in all, *Gazon* would be a pretty good buy for anyone who enjoys arcade-like games.

(K & K Computorware, 37326 Gregory Drive, Sterling Heights, MI 48077, $15.95 on tape or $19.95 on disk)

—Dennis Reiter

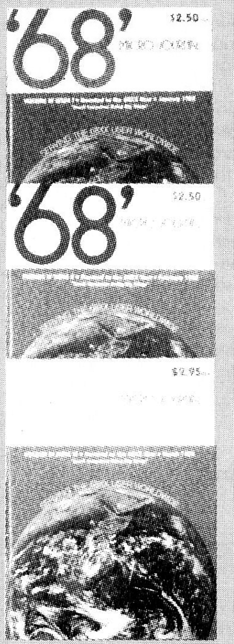
Hint . . .

Junk Eraser

Here's an easy way to end many tape I/O errors. Position tape where program is to be saved. Then press play and record, and type in *MOTOR ON*. Estimate the length of your program, add a few seconds more, and type *MOTOR OFF*. Rewind to original position, and save in normal way.

This will erase any unwanted junk on the tape, thus allowing a clean saving process.

Dan Rowe
Harrah, WA



™TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

> There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

NOTE: This and other interesting and needed articles for the Radio Shack TRS-80 color computer™ are being included monthly in 68 Micro Journal—The Largest specialty computer magazine in the world!

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HINTS for Expanding Memory, Power Supply Cooling, repairing sticky keyboards, disabling the ROM PAK "Take Over", hooking up to Printers, etc.
DISCUSSIONS of the 6883 Synchronous Address Multiplexer, using the Color Computer™ with 64K and 96K memory (which it is ALREADY capable of handling), thoughts on Programming, etc.

I suggest that you subscribe to **68 Micro Journal™**, SOON, as many back issues are sold-out.

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Bob Nay
Color Computer Editor

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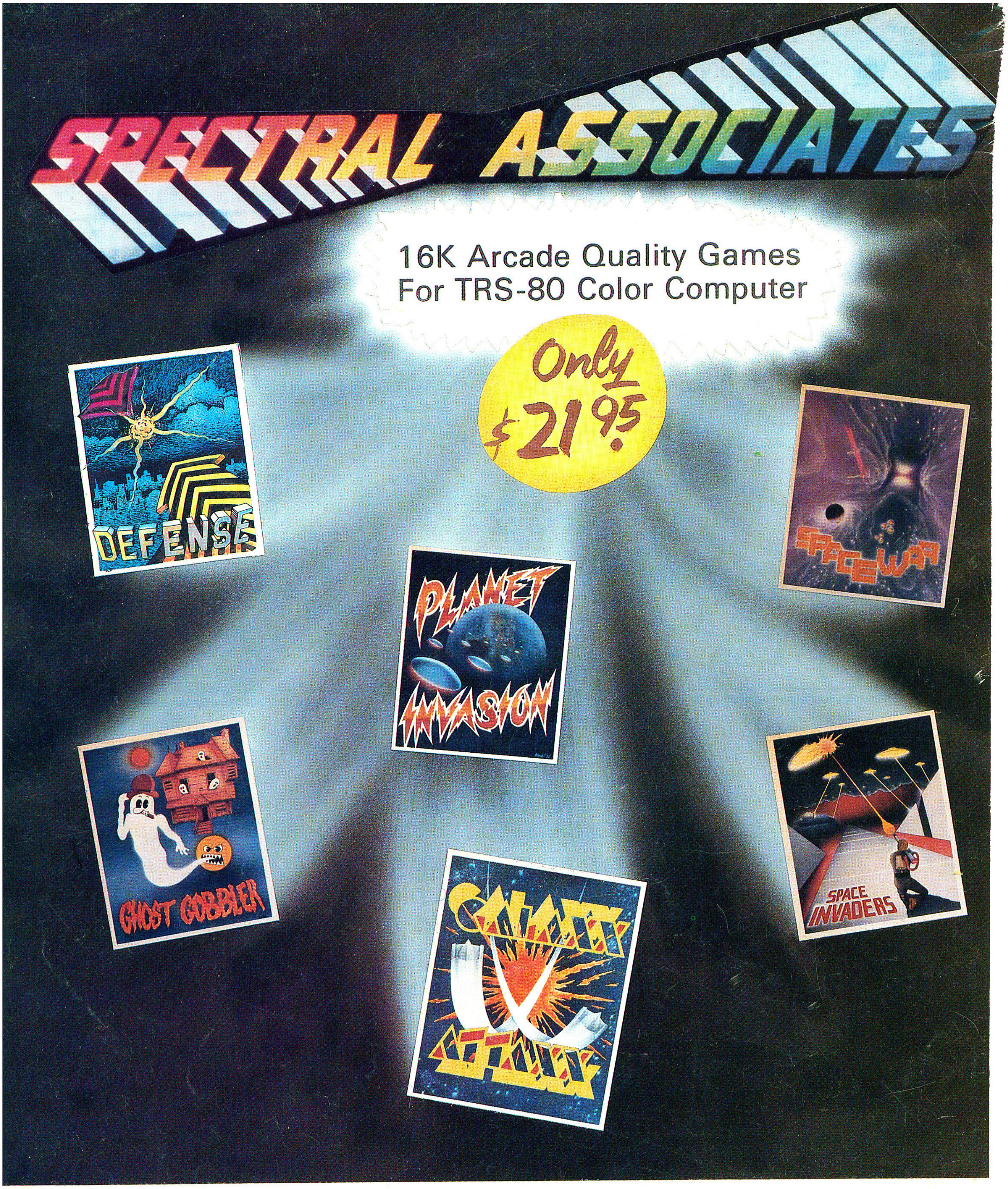
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